

**Isoquantal Capital Modulation:  
A Harmonic Modeling Approach to Understanding and Managing  
the Investment Decision**

by

**William J. McKibbin**

ISBN: 1-58112-279-9

**DISSERTATION.COM**



Boca Raton, Florida  
USA • 2005

*Isoquantal Capital Modulation:  
A Harmonic Modeling Approach to Understanding and Managing the Investment Decision*

Copyright © 2005 William J. McKibbin  
All rights reserved.

Dissertation.com  
Boca Raton, Florida  
USA • 2005

ISBN: 1-58112-279-9

ISOQUANTAL CAPITAL MODULATION:  
A HARMONIC MODELING APPROACH TO UNDERSTANDING AND MANAGING  
THE INVESTMENT DECISION

by

William J. McKibbin

A Dissertation Presented in Partial Fulfillment of  
Requirements for the Degree  
Doctor of Philosophy

Capella University

April 2005

Copyright © 2004-2005 William J. McKibbin

ISOQUANTAL CAPITAL MODULATION:  
A HARMONIC MODELING APPROACH TO UNDERSTANDING AND MANAGING  
THE INVESTMENT DECISION

by

William J. McKibbin

has been approved

April 2005

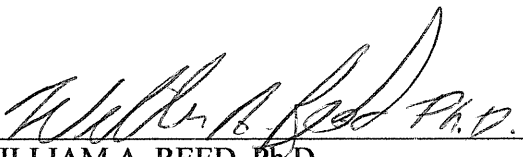
APPROVED:

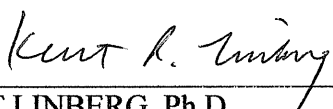
William A. Reed, Ph.D., Faculty Mentor & Committee Chair

David G. Boyd, Ph.D., Faculty Evaluator & Committee Member

Sajay Samuel, Ph.D., Visiting Scholar & Committee Member

ACCEPTED AND SIGNED:

  
WILLIAM A. REED, Ph.D.

  
KURT LINBERG, Ph.D.  
Executive Director, School of Business & Technology

*Primum non nocere*

## ABSTRACT

The purpose of business is to employ capital factors in such a manner as to generate value for its customers and profits for its owners. To achieve these ends, management must make at least three distinct decisions – the operating, investment, and financing decisions. The purpose of this study is to formulate a modeling methodology that harmonically analyzes and explains how the investment decision and capital elasticity influence competitive advantage. The research explores the descriptive literature for the current states of computational modeling, accounting theory and practice, managerial finance, macroeconomics, capital theory, and harmonic analysis in order to provide evidence supporting the content validity of a proposed modeling framework, which encodes, modulates, and transforms raw financial data into waveforms suitable for harmonic analysis. The framework is operationalized algebraically, translated into a high-level computational language, and subsequently tested using simulation methods in order to analyze the computational robustness of the implementation. Finally, empirical testing shows a significant correlation exists between the model's reported results and the profitability of sole proprietorships in the U.S. providing initial evidence of the framework's construct validity. Additional empirical testing shows that the relationship between the model's reported results and net profitability is stronger than results returned from the use of raw capital magnitudes providing evidence of the model's positive capacity for recommending decisions. The study uses extant financial data obtained from the Internal Revenue Service (IRS), which maintains and releases Federal tax information extracted from its archives into the public domain through its Statistics of Income (SOI) programs.

To my nieces and nephews...

Ralph Matthew McKibbin

Joanne Michele Stocker

James Joseph McKibbin

Michael Paul McKibbin

Morgan Julia McKibbin

Kyle Jeffrey McKibbin

William Scott McKibbin

Jacob Patrick McKibbin



## ACKNOWLEDGEMENTS

I would like to acknowledge and thank the many faculty and staff members with whom I had the privilege of associating during my studies at Capella University, as well as my previous studies at: Georgetown University, Washington, DC; Temple University, Philadelphia, PA; Valley Forge Military Academy, Wayne, PA; the Command & General Staff College, Ft. Leavenworth, KS; the George C. Marshall European Center for Security Studies, Garmisch-Partenkirchen, Germany; and the Defense Language Institute, Presidio of Monterey, CA. I would also like to extend special recognition to the founders of Capella University for having the courage to pursue their vision of what learning can become.

Funding for my education originated from a variety of personal and institutional sources. I wish to acknowledge and thank my parents, Mr. and Mrs. Ralph E. McKibbin for their gifts. I also wish to acknowledge the generous scholarship support I received as a young cadet from Valley Forge Military Academy. Other substantial funding originated through various programs of the Pennsylvania Higher Education Assistance Agency, U.S. Department of Education, U.S. Department of Defense, and U.S. Department of Veterans Affairs.

I would like to thank the members of my dissertation committee, including Dr. William A. Reed, Dr. David G. Boyd, and Dr. Sajay Samuel for their patience, ideas, and support throughout the dissertation process. In addition, I would like to thank Dr. Martha S. Hollis and Dr. David Y. Sze for their helpful suggestions and ideas regarding how to improve the research.

Over the years, I have had the opportunity to learn from a number of exceptional teachers, professors, practicing professionals, and leaders. From this group, I would like especially to recognize Ms. Denise Hartley, Dr. Frederick D. Herzon, and Dr. Richard T. Stites, all of whom possess extraordinary gifts and talents as educators from which I benefited.

Additionally, I had the good fortune to have been led early during my career by Dr. John E. Counts and Dr. John C. Reppert – their leadership and personal example is a lasting inspiration that continues to challenge me daily. Finally, I would like to acknowledge an intellectual debt to Dr. Wolfgang Heindl with whom I had the privilege of consulting and observing in professional practice.

To my family, friends, colleagues, and the many other special people who have touched my life and provided me with so many insights and inspirations over the years – to each of you my sincerest thanks and very best wishes always from the bottom of my heart.

Finally, to my wife Sally – thank you for believing in me and us...

William Jeffrey McKibbin  
State College, PA

## CONTENTS

ACKNOWLEDGEMENTS.....	vii
CONTENTS.....	ix
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xiii
LIST OF SPECIAL SYMBOLS.....	xv
CHAPTER 1. INTRODUCTION.....	1
Problem.....	5
Background.....	6
Purpose.....	8
Organization for Remainder of Study.....	9
CHAPTER 2. THEORETICAL BACKGROUND.....	12
Modeling.....	12
Accounting and Finance.....	29
Reliability and Validity.....	45
Algorithms.....	52
Accuracy and Precision.....	54
Neoclassicism.....	57
Aggregation.....	62
Efficiency.....	62
Dynamics.....	64
Ratios.....	67
Isoquants.....	69
Factors.....	71

Vectors .....	76
Networks .....	78
Waves.....	80
Patterns.....	85
CHAPTER 3. THEORETICAL CONSTRUCT .....	92
Process .....	92
Boundaries .....	92
Parameters.....	95
Operationalization.....	97
Functions.....	98
Modulation.....	101
Inversions.....	110
Homogeneity.....	114
Power .....	116
Programming.....	116
Simulation.....	120
Encoding.....	134
Optimization .....	137
Harmonics .....	140
CHAPTER 4. EMPIRICAL METHODOLOGY.....	149
Overview.....	149
Research Hypotheses .....	150
Assumptions.....	150
Procedure .....	150

Data.....	155
CHAPTER 5. DATA COLLECTION AND ANALYSIS.....	159
Hypothesis Testing.....	159
CHAPTER 6. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS.....	168
Results.....	168
Conclusions.....	172
Recommendations.....	174
REFERENCES .....	177
APPENDIX A. PROGRAMMING INSTRUCTIONS.....	208
APPENDIX B. PROGRAMMING CODE.....	210
APPENDIX C. HYPOTHETICAL TAX SUBMISSION .....	225
APPENDIX D. OPTIMIZATION (SCENARIO 1).....	229
APPENDIX E. OPTIMIZATION (SCENARIO 2).....	230
APPENDIX F. INTEGRATED DEVELOPMENT ENVIRONMENT .....	231
APPENDIX G. SIMULATION DATA.....	232
APPENDIX H. MULTIPLE CORRELATION RESULTS (PRIMARY METHOD).....	258
APPENDIX I. MULTIPLE CORRELATION RESULTS (ALTERNATE METHOD).....	279
APPENDIX J. INCOME AND EXPENSE DATA ANALYSIS .....	300

## LIST OF TABLES

Table 1. Comparison of universals, epistemologies, and functional contributions .....	27
Table 2. <i>IsoCap</i> Boundaries Chart.....	94
Table 3. Simulation Summary Statistics.....	124
Table 4. Simulation Data Summary.....	125
Table 5. Income/Expense Summary (Hypothetical).....	135
Table 6. Non-Optimized Input Data (Hypothetical).....	138
Table 7. <i>IsoCapRelative<sub>h</sub></i> * Results (Hypothetical).....	139
Table 8. <i>IsoCapSynergy</i> * Results (Hypothetical).....	139
Table 9. Evaluating Measurement Reliability and Validity Coefficients .....	152
Table 10. Multiple Correlation Summary Results (1998-2002).....	159
Table 11. <i>IsoCapMod</i> Empirical Implications.....	171

## LIST OF FIGURES

Figure 1. The modeling process.....	15
Figure 2. Model evaluation framework .....	19
Figure 3. Relationship between hypothesis, theory, and science.....	51
Figure 4. Internal verification model .....	55
Figure 5. External verification model .....	56
Figure 6. Isoquants, iso-cost lines, capital, labor, and substitution grids .....	70
Figure 7. Market value taxonomy depicting relationship between financial capital and the components of intellectual capital.....	73
Figure 8. Logically collapsed version of the Skandia taxonomy.....	74
Figure 9. Dynamic capital structure.....	75
Figure 10. Illustration of a vector, its magnitude (length) and direction (arrowhead).....	77
Figure 11. Positive and negative signed graphs.....	79
Figure 12. Sinusoidal waveform projection of point P onto the y-axis .....	83
Figure 13. Comparison of a sinusoidal waveform and a wavelet.....	84
Figure 14. Process view of IsoCapMod analysis.....	93
Figure 15. Influence diagram of expenditures, investments, and magnitudes.....	96
Figure 16. IsoCapMod construct.....	102
Figure 17. Visualization of three resonating capital intensities with temporal inversions .....	113
Figure 18. Forecast values for CapMag <sub>2</sub> based on level distribution .....	126
Figure 19. Forecast values for CapMag <sub>3</sub> based on level distribution .....	126
Figure 20. Forecast values for IsoCapSynergy .....	127
Figure 21. Forecast values for IsoCapChange <sub>1</sub> .....	127

Figure 22. Forecast values for IsoCapChange <sub>2</sub> .....	128
Figure 23. Forecast values for IsoCapChange <sub>3</sub> .....	128
Figure 24. Forecast values for IsoCapRelative <sub>1</sub> .....	129
Figure 25. Forecast values for IsoCapRelative <sub>2</sub> .....	129
Figure 26. Forecast values for IsoCapRelative <sub>3</sub> .....	130
Figure 27. Simulation sensitivity chart for target IsoCapRelative <sub>1</sub> .....	130
Figure 28. Simulation scatter plot regressing IsoCapSynergy and IsoCapChange .....	131
Figure 29. Simulation scatter plot regressing IsoCapSynergy and IsoCapRelative .....	132
Figure 30. Simulation Results for IsoCapChange.....	133
Figure 31. Simulation Results for IsoCapRelative .....	133
Figure 32. Waveform comparisons of IsoCapChange from Table 6.....	141
Figure 33. Waveform comparisons of IsoCapChange from Table 7.....	142
Figure 34. Waveform comparisons of IsoCapChange from Table 8.....	143
Figure 35. Waveform decomposition analysis of simulated raw data feed .....	148
Figure 36. Hypothesis <sub>1</sub> variable relationships for multiple correlation analysis .....	153
Figure 37. Hypothesis <sub>2</sub> variable relationships for comparative multiple correlation analysis ..	154
Figure 38. Matrix evaluation of the IsoCapMod capacities based on this research .....	173



## LIST OF SPECIAL SYMBOLS

$AB$	line segment $AB$
$\overrightarrow{AB}$	vector $AB$
$\overleftrightarrow{AB}$	continuous line $AB$
$ AB $	length line segment $AB$
$\Delta ABC$	triangle $ABC$
$ \Delta ABC $	area $\Delta ABC$
$s_{\Delta ABC}$	semi-perimeter $\Delta ABC$
$\angle ABC$	angle $ABC$
$A$	circle $A$
$ A $	area circle $A$
$r_A$	radius circle $A$
$\wedge$	and
$\vee$	or
$\rightarrow$	implies
$\leftrightarrow$	if and only if
$\in$	element of
$\notin$	not an element of
$\equiv$	equivalent to, congruent with
$*$	optimize, convolution maximum or minimum
$\psi$	wave function
$\varphi$	wavelet function

$\mu$	population
$\alpha$	alpha
$\sigma$	elasticity

## CHAPTER 1. INTRODUCTION

Industrial capitalism appeared during the nineteenth-century as the unprecedented concentration of production means in the hands of a new class of entrepreneurial elites. These means included large-scale combinations of fixed assets, scientific inventions, and industrial labor forces (Chandler, 1977, chap. 8; Marx, 1952, part 7; Weber, 2003, chap. 27). The subsequent evolution of capitalist intent laces the history of the twentieth-century – modernity<sup>1</sup> is its culmination.

As the third millennium approached, technological and structural innovations accelerated, ultimately impacting industrial capitalism with a quasi-sudden “powershift” in capital allocations from tangible to intangible assets, and from industrial labor forces to a new class of knowledge workers<sup>2</sup> (Bell, 1999, chap. 3; Chandler, 1992, pp. 80-83; Drucker, 1999, chap. 5; Stewart, 1997, chap. 3; Toffler, 1990, pp. 16-17, 32, 41-42, 385). These changes created concomitant demands upon institutions and governments as national and international economies became absorbed by globalization,<sup>3</sup> and upon societies as people sought refuge from the risks of modernity, class and

---

<sup>1</sup> Modernity refers to the consequences of industrialization. The important thinkers about modernity include: Benjamin, Blanchot, Joyce, Nietzsche, Simmel, and Sowers (Lechte, 1994, pp. 201-229). In particular, Simmel (1990) argues that the advent of money objectifies various time distance factors affecting community, commerce, values, and lifestyle. This reification of money into a public instrument was significant, especially during the Industrial Revolution when land was still the predominant form of wealth throughout most of Western and Asian civilization.

<sup>2</sup> Drucker (1959; 1995, p. 226) claims credit for coining the term “knowledge worker.” The appearance of knowledge work can be attributed to the changed requirements for specialization and coordination in the new economy (Becker & Murphy, 1992, pp. 1137, 1156-1158). Each of these activities are polyvalent and therefore difficult, perhaps impossible, to delegate (Cohen, 2003, pp. 28-29). Bell (1976, p. 47) describes the axial principles, design, and methodology of pre-industrial society as “traditionalism” in a “game against nature” based on “common sense, trial and error, [and] experience”; industrial society as “economic growth” in a “game against fabricated nature” based on “empiricism [and] experimentation”; and post-industrial society as the “codification of theoretical knowledge” in a “game between persons” premised on “models, simulations, decision theory, [and] systems analysis.”

<sup>3</sup> A characteristic of globalization is the shift in jurisdiction from national and international rules of trade promulgated and enforced by sovereign states, to standards set by global entities. “Unfortunately, we have no world government accountable to the people of every country to oversee the globalization process... Instead, we have a system that might be called global governance without global government, one in which a few institutions... [and] a

spatial polarization, and cosmopolitanism through a return to parochial values and nationalist sentiments (Beck, 1992, pp. 51-84; Kolko, 2000, pp. 33-34, 83-84, 119; May, 2002, pp. 149-161; Sassen, 2001, pp. 251-325; Stiglitz, 2003, pp. 3-22, 255-258; Toffler, pp. 364-379, 446-449; Toulmin, 1990, pp. 175-209).

The combined pressures of these resource and attitudinal shifts have understandably influenced the epistemological<sup>4</sup> tenets of modern economics:

The alliance of information technology and the white-collar assembly line raises issues of society and ethics that have preoccupied social thinkers since the times of Adam Smith, John Stuart Mill, and Karl Marx – issues that exist quite independently of the economist’s concern about the impact this alliance might have upon output, productivity, and wages. (Head, 2003, p. 13)

Power<sup>5</sup> is the quantum sum of the vectored energies of knowledge, wealth, and violence (see Toffler, 1990, pp. 12-20). This framework finds expression in enterprise as human, financial, and structural capital (Anell et al., 1989, p. 20). Just as the boundaries of power change, capital allocations change. Yet, while the lines of the former industrial system were at least bound by the Newtonian conceptions of mechanical physics, change is now often attributed to such causes as “uncertainty,” “anomalies,” “shocks,” or some other lofty but equally pretentious notion of time-space deception.<sup>6</sup> Nevertheless, there is some truth in these

---

few players... closely linked to certain financial and commercial interests... dominate the scene, but in which many of those affected by their decisions are left almost voiceless” (Stiglitz, 2003, pp. 21-22).

<sup>4</sup> Epistemology is “the branch of philosophy that studies the nature of knowledge, in particular its foundations, scope, and validity” (Encarta, 2004).

<sup>5</sup> In physics, power is “the rate at which work is done or energy is transferred” (Isaacs, 2000, p. 376). Toffler (1990) defines power as “the ability to mobilize and use violence, wealth, and/or knowledge, or their many derivatives, to motivate others in ways we think will gratify our needs and desires” (p. 504). Note that Toffler’s use of the term violence is generally figurative and includes coercion (as in the threat of violence that lurks behind the law) in addition to physical force (p. 13). Finally, Berle (1969, p. 143) defines economic power as the “capacity to cause or refuse production, purchase, sale, or delivery of goods, or to cause or prevent the rendering of service (including labor),” a definition that implies coercion is a form of economic power.

<sup>6</sup> Mandelbrot and Hudson (2004, pp. 227-252) argue that fractal geometry accounts for the unexpected turbulence often encountered in financial markets, a view that stands in direct challenge to modern portfolio theorists who contend that large market swings are anomalous: “I claim that variations in financial prices can be accounted for by

explanations for “the characteristic of the impending waves of rationalization... is their boundary-crossing and boundary-changing potential” (May, 2002, p. 217).

The consequences of modernity fundamentally change the dynamics of enterprise through the separation of time and space, the development of disembedding<sup>7</sup> mechanisms, and the reflexive appropriation, embodiment, and commoditization of knowledge by institutions (Fuller, 2002, pp. 118, 120; Giddens, 1990, p. 53; 1991, pp. 14-23). These dynamics, enabled by advancements in telecommunications and information technology, have led to the emergence of a new economy<sup>8</sup> – an economy that operates in “space” rather than a “place”<sup>9</sup> (Kelly, 1998, p. 94). Moreover, the changes have impact the capitalization requirements of enterprise in a manner that accelerates modernity to the dismay<sup>10</sup> of many in human society:

What is emerging is neither industrial nor familial production, neither the service nor the informal sector; it is a third entity, a blurring or a subversion of the boundaries in sector-spanning forms of combination and cooperation, for the peculiarities and problems of which we have yet to develop a conceptual and empirical sensitivity. (May, 2002, p. 219)

It is this need for “conceptual and empirical sensitivity” that most intrigues the social scientist, for it is only by such that one can construct coherent explanations for social phenomena

---

a model derived from my work in fractal geometry. Fractals – or their later elaboration, called multifractals – do not purport to predict the future with certainty. But they do create a more realistic picture of market risks. Given the recent troubles confronting the large investment pools called hedge funds, it would be foolhardy not to investigate models providing more accurate estimates of risk” (Mandelbrot, 1999, p. 71). See Mandelbrot (1997) for a detailed mathematical analysis of fractals and scaling in finance.

<sup>7</sup> Knowledge is said to be embedded in animates (i.e., humans), but embodied by technology (Fuller, 2002, p. 118; Stuart, 2002, pp. 99-100).

<sup>8</sup> The new economy is the changed economic environment that has emerged as a consequence of innovations in high-technology, knowledge-based products, and services (Baddeley, 2003, p. 224). For evidence supporting the emergence of a new economy, see Guo and Planting (2000).

<sup>9</sup> “Place” implies a location or position bounded vertically between levels and ranks, horizontally between functions and disciplines, externally between organizations, suppliers, customers, and regulators, and geographically between cultures and markets (Ashkenis, Ulrich, Prahalad, & Jick, 1995, p. 3), whereas “space” implies ubiquity (Buchanan, 2000, pp. 15-24, 139-160, 233).

<sup>10</sup> Humanists cite a general erosion of social capital as evidence of a reconstitution of social order since the mid-1960’s (e.g., Fukuyama, 1999; Putnam, 2000).

in a manner that is understandable and useful to humanity. If it is the nature of capital to be reflexively<sup>11</sup> probabilistic with incomplete determinism<sup>12</sup> while forming a parsimonious viscosity<sup>13</sup> that unifies the vectored energies of enterprise into power, then measuring, analyzing, and monitoring the “implicate order” (Bohm, 1980, pp. 1-26) of capital dynamics becomes an urgent management imperative.<sup>14</sup>

---

<sup>11</sup> The economic theory of reflexivity relates to serial decision-making. Sometimes dubbed the “Lucas effect,” the theory posits, in essence, that economic policy decisions are made by agents who rely on serial data that are influenced by previous policy decisions resulting in reflexivity between decisions (Lucas, 1981, pp. 104-130).

<sup>12</sup> A fundamental difference between classical and quantum theory is that the former deals with continuously varying quantities while quantum theory also deals with discontinuous or indivisible processes. A second contrast is that classical theory is completely deterministic in the sense that variables from the past relate causally to those of a later time, whereas quantum laws determine only the probability of future events in terms of conditions given in the past (Bohm, 1951, p. 26; 1957, pp. 79-91; Prigogine, 1997, pp. 129-151). Nevertheless, quantum theory still appeals to the classical approach to obtain meaning: “Classical theory presupposes the classical level and the general correctness of classical concepts in describing this level; it does not deduce classical concepts as limiting cases in quantum concepts” (Bohm, 1951, p. 625). Conversely, quantum theory limits the validity of classical mechanics (Prigogine, pp. 107-128). The essential course of the crucial experiments confirming quantum mechanics can be traced through the seminal works of Aspect, Dalibard, and Roger (1982), Bell (1964), Einstein, Podolsky, and Rosen (1935), and Weihs, Jennewein, Simon, Weinfurter, and Zeilinger (1998). See Nadeau and Kafatos (1999), Prigogine (1997), and Peat (2002) for various nonmathematical discussions of the implications of quantum theory for the social sciences.

<sup>13</sup> Parsimony emphasizes economy of means in nature and the universe (Hildebrandt & Tromba, 1996, p. 17). Parsimonious viscosity refers to and describes the complexity solution of self-organization. Complexity (or chaos) theory is “a science of process rather than state, of becoming rather than being,” which directs its attention to the elements of motion and oscillation in an effort to identify the global or universal properties (i.e., the patterns) found in “disorder, chaos, the discontinuous, the erratic, and the irregular” (Gleick, 1987, pp. 3-8, 30, 56, 118, 153, 211, 240, 299, 300). Chaos theory is “the qualitative study of unstable aperiodic behavior in deterministic nonlinear dynamical systems” (Kellert, 1993, p. 2). See the seminal works by Feigenbaum (1978; 1979) together with the early work of Prigogine and Stenger (1984) for analyses and discussion of universality and complexity.

<sup>14</sup> Implicate order finds information about the whole contained in each structural part, and rejects the fragmented view of wholeness held by classical physicists (Bohm, 1980, pp. 38-39, 115-118, 123-125, 176-177; Morgan, 1997, pp. 251-252). This whole (or wholeness) implies that each structural part is in perfect harmony with the entirety (Colman & Coan, 2003, pp. 3-8; Hildebrandt & Tromba, 1996, pp. 41, 48, 63; Kepler, 1952, pp. 1009-1085; Strogatz, 2003, pp. 1-2, 35, 250): “‘Order is Heaven’s First Law....’ What does the term ‘order’ imply in this connection? It would seem to imply the just correlation of each of the parts of an object with the whole. This means that all of the details of a form in Nature are accurately united in perfect harmony, but the scheme of this unity can only be determined with precision by the use of mathematical measurements, angles, points, lines, and surfaces, produced by geometric principles. Unity is the highest element of beauty, and there can be no question but that the laws of growth in Nature are the fundamental ones which govern it” (Colman & Coan, p. 3). Morgan (1997, pp. 251-300) argues that the notion of implicate order draws on the change processes described by autopoiesis, complexity (or chaos), cybernetics, and dialectics. Another term used to describe this harmony is coherence, which is “the quality of being logically or aesthetically consistent, with all separate parts fitting together to form a harmonious or credible whole” (Encarta, 2004). “Coherence is central to many emergent properties of collective systems.... While coherence in a single object... is now well understood, the behavior of collections

### Problem

The purpose of business is to employ capital factors in such a manner as to generate value for its customers and profits for its owners.<sup>15</sup> To achieve these ends, management must make at least three distinct decisions – the operating, investment, and financing decisions.<sup>16</sup> Operating decisions are about matters of production, pricing, marketing, and so forth. The investment decision refers to the optimal mix of capital factors necessary to fulfill the operating decision. Financing decisions refer to the manner of obtaining the capital required by the investment decision (Helfert, 2003, pp. 2-16).

Making the operating, investment, and financing decisions in business requires the presence of human capital. The operating decision culminates in the creation of structural capital. The financing decision culminates in the formation of financial capital. Thus, every business is comprised of human, structural, and financial capital.<sup>17</sup> The totality of these decision segments comprise the business system of the enterprise (Helfert, 2003, pp. 2-16). This study

---

of coherent interacting objects remains largely unexplored. Exploring the uses of coherence in such a complex environment is a tremendous challenge. New techniques and approaches must be developed to create and interact with these coherent systems. Improved computational techniques must be developed to model the effects on coherence” (*Complex Systems*, 1999, p. 7).

<sup>15</sup> Friedman (1962) argues that “there is one and only one social responsibility of business – to use its resources and engage in activities designed to increase its profits...” (p. 133). Conversely, Hammer (1996) argues that “the mission of business is to create value for its customers” (p. 97). The above statement attempts to combine the two views. The view that visionary companies seek to leverage values such as ideology (a form of structural capital) ahead of profits is a major finding of Collins and Porras (1997, pp. 8, 46-79, 282-284). Likewise, Porter (1985) argues that companies seek to achieve a sustainable competitive advantage within an industry in order to position the business to achieve above-average profitability, further arguing that “without a sustainable competitive advantage, above-average performance is usually a sign of harvesting” (p. 11). See also the seminal historical and philosophical analysis by Drucker (1946, pp. 230-263) contrasting the notions of production for “use” and for “profit.”

<sup>16</sup> Note that the operating, investment, and financing decisions precede the creation of competitive advantage, profits, and shareholder value (Helfert, 2003, pp. 2-3, 434-436).

<sup>17</sup> This conclusion regarding the mandatory presence of human, structural, and financial capital is reached *a priori*. On this basis, other forms of enterprise culminating exclusively in wages, rent, interest, royalties, capital gains, dividends, etc., are not true businesses. Merely obtaining a business registration or other certificate of formation is not synonymous with being “in business.” It is only after the operating, investment, and financing decisions are made and implemented that an entity can be considered to be “in business.”

focuses on the investment decision within the context of the business system as a common problem of enterprise.

### Background

Managers activate enterprise by making operating, investment, and financing decisions. These decisions require from management the ability to harmonize multiple capital factors with flair and genius in anticipation of value creation and profits. Hence, the responsibility for the success and failure of the enterprise rests upon the calculus underlying these decisions. The following hypothetical scenarios invoke the conceptual intuition underlying the management problem.

A homeowner requires a plumbing repair and a reputable plumber arrives on the scene. The plumber is qualified and experienced. However, there is a problem – the plumber’s tools were recently stolen. At first glance, it appears that the plumber brings valuable skills (human capital) to the job, however the absence of tools (financial capital) reduces the plumber’s usefulness by not only the value<sup>18</sup> of the tools (financial capital), but the value of the plumber’s time (human capital) as well. Yet, there is a simple solution – the plumber takes the time (human capital) to purchase replacement tools (financial capital) in order to complete the job. This solution is acceptable to the plumber (human capital) because the plumber has business insurance (financial capital) that covers the theft of tools. Thus, the value of the plumbing service (human capital) is restored. The repair completed, the homeowner pays the plumber (human capital) and the plumber incurs the costs of the replacement tools (financial capital) pending an insurance settlement.

---

<sup>18</sup> For these purposes, value is a function of usefulness over time. Hence, utility also implies maximization of frugality, as in “enjoying the virtue of getting good value for every minute of your life energy and from everything you have the use of” (Dominguez & Robin, 1992, p. 167).



A family is seeking a loan to buy a house. The family learns that an out-of-state lender has money available at an interest rate that is half that of the local competition. However, there is a problem – to complete the loan the borrower must travel out-of-state, in person, to sign the paperwork. Hence, even though the loan (financial capital) looks attractive, the value of the loan to the borrower collapses because of the absence of local service (structural capital). Yet, there is a solution – an agent for the lender (human capital) initiates paperwork to complete the transaction through the mail (structural capital). This solution restores the value of the loan (financial capital) at moderate cost to the lender. The homeowner signs the loan agreement (financial capital) and the lender incurs the additional costs (structural and human capital) of closing the deal out-of-state. Immediately thereafter, the lender makes a policy decision to disqualify out-of-state applicants, thus eliminating the additional costs involved with future out-of-state lending.

A small business owner is seeking to automate certain business processes. The business owner learns that a software solution offered by “AcmeSoft” is perfect for the purpose. However, there is an issue – the software requires professional installation by the vendor and the technician who does installations for “AcmeSoft” recently retired. Thus, even though the software (structural capital) provides a great potential solution, its value to the business owner is diminished because of the absence of a technician (human capital). In response, “AcmeSoft” engages an employment agency (structural capital) in an attempt to recruit a new technician (human capital) and restore the value of its software offering (structural capital). Unfortunately, the employment agency is unable to find a replacement technician who is willing to work at the wage rate offered by “AcmeSoft.” In the meantime, the small business owner identifies an alternative solution available through a competing vendor, thus ending the sales negotiation with