Stimulating Perspective and Reflection in a Course on Value-based Management: An Interdisciplinary Approach Bridging East and West

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Globalization, accelerating change, increasing complexity, interdisciplinary technologies, sustainability and the need for enhanced ethical behaviour—all call for more reflection and overview. The management course for technology students outlined in this article aims at increasing student's independent thinking and perspective in three ways: (*i*) *value-based management where sound human values are given higher priority than profit,* (*ii*) *parallels that link the natural sciences and the social sciences and* (*iii*) *knowledge from both East and West. Interdisciplinary parallels—which only takes a few minutes of each lesson—can be applied to any discipline and may improve the learner's ability to think independently and to see interconnectedness.*

Keywords: value-based management, education, interdisciplinary parallels, East and West

Introduction

The world is becoming increasingly complex, dynamic and interconnected, and the consequences of human action more far-reaching. These challenges are particularly evident in multidisciplinary disciplines such as business, sustainability, biotechnology, and nanotechnology. Therefore, the growth and diversification of knowledge need to be complemented by overview, unification and reflection—thus calling for an interdisciplinary approach to education.

*The author would like to thank Knut Lehre Seip, Per Ø. Staff, Karl P. Bullock and Dennis P. Heaton for their valuable contributions.

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Journal of Human Values 16:2 (2010): 169–186
SAGE Publications *Los Angeles/London/New Delhi/Singapore/Washington DC*
DOI: 10.1177/097168581001600204

There are a wide range of organizational and societal cultures in the world. To be successful in the global marketplace, management also needs to integrate and adapt to this diversity. Due to space limitations, we will only mention the need to bridge Eastern and Western traditions and thinking, which is important today due to the rapid growth in Asia (i.e., China is now the second-biggest economy in the world).

Sooner or later in their career, many technology students become managers. Broadly speaking, management deals with people and technology with things. Teaching management to technology students therefore raises two challenges. First, management also includes quantitative knowledge such as mathematics, statistics, finance, economics and technology—with two lines under an unambiguous answer. However, somewhat in contrast to technology, the practice of management is largely qualitative, requiring knowledge, skills and abilities about communication, motivation, meaning-making, ethics, human values, judgement and empathy (e.g., Harung, 1996)—the more so the higher up the corporate ladder one is.

Second, life is interdisciplinary. Yet, it seems that in today's education the focus is mainly on learning *specialized* knowledge (facts, theories and professional skills), with little emphasis on interdisciplinary *overview* and reflection. Of course, the youth of today are open-minded and most students have interests outside their studies, e.g., sports, culture, or humanitarian work. Through media, the Internet, social interaction, a variety of jobs and travels, students are, in addition, exposed to a wide range of information and impressions, but this information tends to be multidisciplinary rather than interdisciplinary. In terms of both their chosen discipline and the wide range of input they receive outside the classroom, there may, therefore, be room for improvement with respect to interconnectedness, perspective and independent thinking.

This article describes a management and ethics course for technology students who are in the second or third year of a three-year Norwegian bachelor's degree at Oslo University College. About 25 per cent of the students are from outside Norway, mainly from Asia, which makes the East–West diversification directly relevant. During each lesson of this course, a few minutes are spent placing the specialized knowledge in a broader perspective by presenting parallels between management and technology/natural sciences. The parallels are mainly from science and technology since they are students of engineering. A selection of 11 parallels is presented. Such metaphors can be applied to enhance education and training within any profession or vocation. The article includes survey data indicating that this course stimulates reflection and perspective in the students. Using summary points and interdisciplinary themes in each lesson to provide a broader perspective has for more than 30 years been applied to all courses in all disciplines at Maharishi University of Management (MUM) in Fairfield, Iowa, USA (Schmidt-Wilk, Heaton & Steingard, 2000).

Need for More Overview and Reflection

Several major current advances in science and technology are complex, interwoven and interdisciplinary. On the micro level, biotechnology and nanotechnology involve contributions from such disciplines as physics, chemistry, biology, medicine, business, industry, ethics and information technology (Staff, 2008). On the macro level, in order to prevent global warming and secure sustainable living, there is a need for collaboration among specialists in diverse areas such as energy,

environment, health, business, industry, ethics, food, product development, production, logistics and communication. Management is also cross-disciplinary since it, for example, involves mind (psychology), brain (physiology), organization and society (sociology), economics, marketing, industry (services and products) and environment (e.g., Harung, 1996; Harung, Travis, Blank & Heaton, 2009). The side-effects of allopathic medicines indicate the need for more wholeness, while unethical behaviour and pollution—daily reported by the media—call for more empathy and reflection.

For such reasons, the general plan for engineering education, issued by the Norwegian Ministry of Education and Research (2003), states that 'engineering education shall give knowledge about the interplay between technology, environment, individual, and society, both in general and in relation to the engineer's area of specialization.' At the end of their education engineers shall be able to do the following:

- See technological solutions in an economical, organizational and environmental context.
- Collaborate interdisciplinary to solve complicated tasks.
- Communicate effectively with other disciplines.
- Understand and enact professional and ethical responsibility.

In general, however—although the need for interdisciplinary overview is well established—there seems to be room for improvement in what education *in practice* does to work towards these laudable objectives. Through interaction with colleagues and students at various institutions of higher learning, it is the author's impression that most courses still focus almost exclusively on specialized knowledge. However, the point of this article is not to create a debate about the extent to which perspective and reflection are a part of present courses—rather the point is to provide tested ideas of how this can be done in practice.

Broadly speaking, the West has been mainly concerned with experimental, object-based knowledge, while the East has long traditions that focus largely on experiential, consciousness-based knowledge. On the basis of these complementary approaches, the West has contributed much in terms of science (e.g., Einstein's relativity theories) and technology (e.g., laser technology and the Internet). The East, on the other hand, has provided understanding of higher stages of human development (e.g., Alexander et al., 1990) and practical techniques to realize such mind–brain development in practice, and thereby improve performance and health (Harung et al., 2009). Of course the East has also contributed to groundbreaking quality and productivity, e.g., Toyota. Such factors influence management.

In both India and China there are long traditions that view nature as fundamentally unified[1] (e.g., the ancient Upanishads in the Vedic tradition of knowledge of India and the Tao of China; Capra, 1975; Hagelin, 1987). Hence, the interdisciplinary approach of this course is based on the notion that both matter and mind are the expressions of one underlying *unified field* (see parallel 2 later). A field may be defined as a pervasive wholeness that penetrates and influences the objects within its range. Cross-disciplinary metaphors illustrate how this fundamental field may express itself in recurring themes in different areas of nature. These repeated patterns may explain why mathematics is a powerful, general language that describes order and change across diverse disciplines. Business administration—like any other discipline—should reflect nature's holistic functioning, and

the parallels can, therefore, be used to enhance learning within management and organizational development:

> If nature uses certain principles to create her infinite diversity, it is highly probable that those principles apply to human organizations. There is no reason to think we'd be the exception. Nature's predisposition toward self-similarity can be extremely useful. It can even help us evaluate current management practices, providing a guide through the fads and ideas that plague us, directing our attention to those things that have merit at a deeper level. (Wheatley, 1994, p. 143)

Several Potential Advantages of Interdisciplinary Parallels

There are several potential advantages of drawing parallels between different disciplines and stimulating more reflection and independent thinking:

- *Perspective*: Exposing students to interdisciplinary themes may facilitate understanding that things do not exist in isolation, but rather that they are interconnected and part of a greater picture. Senge (1994, p. 73) cites the following advantages of such an approach: 'Seeing interrelationships rather than linear cause–effect chains' and 'Seeing processes of change rather than snapshots.'
- *Reflection*: 'Teaching students how to think is a universal goal of educational institutions' (Smith, 2003). Yet, Smith writes that there is room for improvement in the way business courses teach students critical thinking and decision making.
- *Learning*: Learning is facilitated by connecting something unknown to something known. The interdisciplinary themes are like known 'pegs' we can 'hang' a wide range of new knowledge on. Since the pegs represent a framework that can be used repeatedly, this contributes to an economical way of learning.
- *Simplification*: A satisfactory handling of today's flood of information can be facilitated through cultivating the ability to extract the essence of a given, often complex situation. Employing more fundamental themes may improve the students' ability to extract what is of primary importance, and to disregard what is secondary, thereby laying the foundation for more effective thinking and action.
- *Creativity*: Themes from other disciplines may present new ideas and new solutions within our own field of specialization, so that we avoid 'reinventing the wheel'. An example here is the express train Shinkansen between Tokyo and Hataka in Japan that runs at a speed of 350 km per hour. When the front of the train was redesigned in accordance with the beak of the Icebird, the speed increased by 10 per cent, the air pressure (and noise level) went down by 30 per cent and the energy consumption was reduced by 15 per cent (Torp, 2010).
- *Learning for life*: If we assume that an average person lives for 80 years and works for 45 years, work time is only 5–6 per cent of life time. Mainstream higher education is largely focused on work life. Adding reflection and interdisciplinary perspective to profession-directed education could complement learning from life experience and contribute to enhanced capacity to master life as a whole.

Course on Value-based Management at Oslo University College

Value-based Management

It seems that we use only a relatively small proportion of our mental potential (Maslow, 1968). Research indicates that mind–brain development progressively enhances individual performance and leadership capacity (Harung, 1999; Harung et al., 2009; Maslow, 1968; Rooke & Torbert, 2005). The management and ethics course at Oslo University College focuses on what happens to organizations as the employees unfold more and more of their innate potential. Higher collective development fundamentally challenges many widely taught and practised management myths. This challenge is illustrated in the textbook for the course, *Built to Last* (Collins & Porras, 2004), which describes value-driven businesses.

Examples of such currently uncommon success principles, which are prevalent in value-based organizations, are as follows: (*i*) High-performing companies do not need to employ external CEOs to stimulate fundamental change; in fact, these companies almost always promote from within to preserve their tight culture. (*ii*) The most successful businesses do not primarily focus on beating their competitors; they focus on beating themselves even when they are far ahead of their competitors—'good enough never is'. (*iii*) 'Clock building, not time telling': Visionary companies do not require high-profiled, charismatic leaders since the focus is on building the whole organization (clock building) and not on promoting the leader (time telling). Thus, visionary businesses take seriously the principle that 'man and life are more important than money' (Harung, 1999). Such a priority may counteract both unethical behaviour and many environmental problems.

In contrast, today's prevalent excessive focus on money—profit at any cost—is evident from the many examples of unethical behaviour and unacceptable pollution that the media daily report on. Of course, value-based management also includes making money. It is not a question of either man or money; it is a quest for both well-being and profit. It is, therefore, gratifying that research suggests that value-based or visionary companies perform on a significantly higher level—including that they earn much more money—than merely profit-driven companies. To illustrate, from 1 January 1926 until 31 December 1990 the average return on investment for the stock in the 18 visionary, high-performing companies investigated by Collins and Porras (2004) grew over 15 times more than the general US stock market. Similarly, Aburdene (2007, p. xxiii) writes that '[w]hat is remarkable and largely unheralded…is that corporate morality often correlates with superior financial performance.'

Teaching Methods

Each lesson is summarized in a few main points. It is a common experience that most of what is presented in a lecture would have been forgotten by the students the next day. To counteract, parallel to each main point there is an interdisciplinary point. These main points contribute to the students remembering what is important rather than just some arbitrary and less significant fragment. Table 1 shows an example of a management main point and the corresponding interdisciplinary perspective.

The teaching methodology has developed over the five years this course has been taught in all close to 2,000 students at Oslo University College.

Table 1
Example of Main Point and Interdisciplinary Metaphors

Management	*Interdisciplinary Perspective*
Organizational cultures tend to remain surprisingly stable over long periods of time in spite of employees coming and going, and in spite of substantial changes in technology, markets and society. Harung (1999) explains this persistence using the proverb 'birds of a feather flock together', and recommends starting an organization with sound values, since we know from health care that prevention is better than treatment.	The co-existence of change and non-change in the organizational culture is like a river: Always the same and always new (water molecules flowing by). Or like a beam of light with new photons constantly radiating out. When we walk, one foot is at any time moving while the other is resting. See also the theme 'preserve the core and stimulate progress'.

Source: Developed by the author.

During the spring of 2009 the course was taught as follows:

- A lecture at the beginning presented the interdisciplinary parallels.
- The compendium included main and interdisciplinary points for each lesson.
- In one of the three obligatory assignments the students wrote about parallels between management and technology.

Eleven interdisciplinary parallels are now presented.

Parallel 1: Life is Structured in Layers

Technology

Our everyday experience—what we hear and see—is in accordance with classical physics, which pictures matter as being concrete and solid, and constructed by atoms that are like billiard balls. Atom means indestructible, and in the Newtonian worldview they are considered to be the most basic building blocks that make up the whole universe, including our own body. However, with the advent of quantum mechanics and quantum field theory, this solid picture has changed radically. Today, physics proposes a unified field, which extends throughout the universe and lies at the basis of everything physical within it: matter, forces, time, space and natural law (Antomatis, Ellis, Hagelin & Nanopoulous, 1988; Hagelin, 1987).

The unified field first expresses itself in the four fundamental fields—electromagnetism, strong force, weak force and gravitation. These four fields then express themselves in the matter and forces that constitute creation. For example, the electromagnetic field—that is responsible for light, TV, telephones, emails, lightning and the functioning of the human nervous system—expresses itself in electrons and photons. The strong and weak forces operate within the nucleus of the atom, and the long-ranging gravitation field keeps celestial balls and systems—earth, moon, sun, solar systems and galaxies—in their orbits.

Starting from the basis, we find the following layers in the material world: unified field, the four fundamental fields, subatomic particles, atoms, molecules, macromolecules and visible matter. The laws of nature are different at different levels, e.g., the laws of quantum mechanics are very

different from those of classical mechanics, and deeper levels are progressively more powerful, e.g., a reaction in nuclear physics releases much more energy than a chemical reaction (Hagelin, 2008). Also, the human anatomy is structured in layers: unified field, DNA, RNA, proteins, cellular components, cells, organs, systems (respiration, digestion, nervous…), and the whole body.

Management

Management is applied psychology. The purpose of management is to stimulate and organize humans in such a way that goods and services are created in an effective way. The mind is also structured in layers (Alexander et al., 1990; Maharishi, 1969), which starting from the most surface level are behaviour; senses; thinking mind (memory, association…); intellect (discrimination, decision…); feelings; ego (integrating all levels into a meaningful experience); and transcendental consciousness—the most basic level of consciousness, a state of inner wakefulness and restful alertness (Samadhi in the Indian tradition).

Most people today are consciously aware only of the more surface levels of the mind, i.e., intellect and above. In step with unfolding deeper levels, there is a progressive growth to higher capacities for well-being and performance (Alexander et al., 1990; Harung, 1999; Harung et al., 2009). It has been found that world-class athletes and top-level managers on several complementary measures displayed significantly higher mind–brain development than average-performing controls, including higher brain integration, higher moral reasoning, and more frequent peak experiences (glimpses of transcendental consciousness; Harung et al., 2009).

Parallel 2: Unification of Matter and Mind

Physics

There are several aspects of quantum physics that point towards a fundamental unification of matter and mind:

- Mathematical equations cognized by the human mind precisely describe the behaviour of matter and forces. The Nobel laureate Eugene Wigner (Hagelin, 2008, p. 12.2) remarked upon '…the unreasonable effectiveness of mathematics in the physical sciences'.
- The wave function describing the subatomic particles is non-material; it only describes the probability of where one will find the participle if one is looking for its position. The basis of matter is non-matter or no-thing, much like consciousness. Henry Pierce Stapp (Oates, 2002), a physicist at the Lawrence Berkeley Laboratory in the US, writes that this probabilistic nature of subatomic 'particles' indicates that they are idea-like rather than matter-like. Albert Einstein (Hagelin, 2008, p. 12.2) wrote, 'The most mysterious aspect of physical reality is its intelligibility.'
- There is a precise quantitative correspondence between (*i*) modern physics—the fundamental vibration modes of the unified field, when it first expresses itself in classical space–time geometry, and (*ii*) ancient Vedic knowledge of consciousness from India, which outlines the fundamental modes of consciousness. The probability that this structural correspondence could be due to statistical coincidence is less than 1/1000 (Hagelin, 2008).

Psychology

Leading physicists go further than this physical wholeness and suggest that also the human mind has its source in the unified field, implying that consciousness and matter are fundamentally one:

- Sir Arthur Eddington, an acknowledged British physicist, concluded that '[t]he stuff of the world is mind-stuff' (Klein, 1984).
- The French physicist Bernard D'Espagnat wrote that '[t]he doctrine that the world is made up of objects whose existence is independent of human consciousness turns out to be in conflict with quantum mechanics and with the facts established by experiment' (D'Espagnat, 1979).

The idea of a fundamental unification of mind and matter has long and strong traditions in the East. For example, the ancient Vedic tradition of India states the following:

- Isha Upanishad: 'That which is far away is within.'
- Katha Upanishad: 'That which is smaller than the smallest is bigger than the biggest.'
- Upanishads: 'I am That, thou are That, all this is That.'

The primacy of consciousness is also found in Western thinking. For example, the American writer, philosopher and poet Ralph Waldo Emerson states that '[a]ll that lies before us and all that lies behind us are tiny matters compared to what lies within us.'

The unification of consciousness and matter in the unified field provides for an integrated view of science, technology and nature as a whole. First, consciousness is now seen as basic to the brain, while the prevalent view is that consciousness is an epiphenomenon of the brain. Second, it provides for a common basis for all fields of knowledge (see Figure 1).

Parallel 3: Action-at-a-Distance

Technology

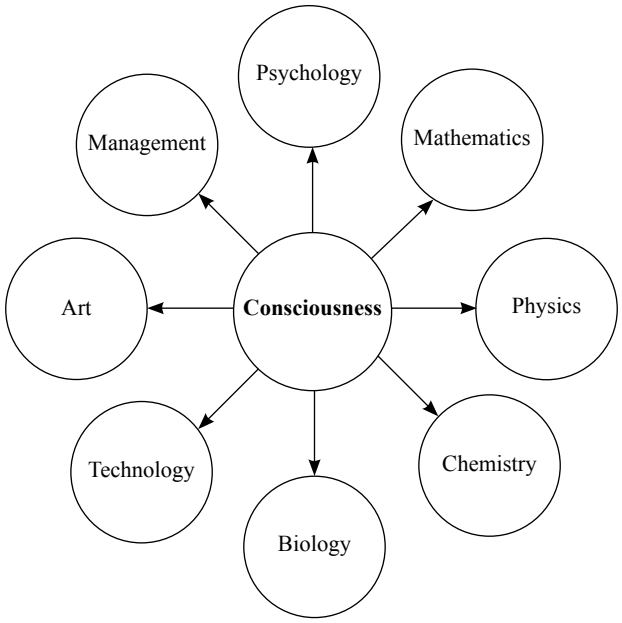
An external load on a structure will result in a stress (force/area) and strain (deformation) at every point in the material, to counteract the external load (based on reaction = action). With varying external loads, the intensity of the stress and strain fields keep changing throughout the structure with a little time delay.

Electromagnetism and gravitation are far-reaching fields—in fact, the gravitational field spans the whole universe. Influences transmitted through these more fundamental fields travel much faster than those in the stress and strain fields. At these more fundamental levels—much closer to the unified field—experiments have shown that two photons, at relatively large distances, influence each other instantaneously (Penrose, 1991, p. 286). Interaction that appears to take place without any time delay is called *infinite correlation*. It is like a spread sheet—you change one number and instantaneously all the other numbers change.

Management

We find a high degree of uniformity and ways of doing things in a corporate culture. As Senge (1994, pp. 242, 44) notes, 'Most of the assumptions we hold are required from the pool of culturally acceptable assumptions,' and as a result, 'we just find ourselves feeling compelled to act in certain ways.' This uniformity explains how a

Figure 1
Consciousness as the Common Foundation of all Knowledge



Source: Developed by the author.

surprisingly strong organizational alignment can be achieved in effective organizations—even in large multinational corporations, across diverse societal cultures and over large physical distances (e.g., Harung, 1999).

It seems that normal communication—through meetings, emails, phone calls, etc.—cannot fully explain the pervasive nature of a corporate culture. A complementary, more fundamental mechanism of communication exists if consciousness is a field. In the words of Wheatley (1994, p. 53), 'The longer I have thought about it, the more I am willing to believe that there are literal fields in organizations.' In fact, researchers have found that society may have a field-like aspect, which works akin to infinite correlation, since a small group of experts can reduce conflicts and improve harmony in a nation, seemingly without significant time delay (e.g., Davies & Alexander, 2005).

Parallel 4: Unity in Diversity

Technology

The structural engineering of the universe is based on the theme 'unity in diversity'. The single, underlying unified field expresses itself and co-exists with a huge multiplicity. To illustrate this diversity: The visible universe consists of more than 10^{80} atoms,[2] which are the building blocks of the universe and life (there are over 30 billion species on earth).

The human brain is made up of 100 billion neurons. Each neuron is connected to a large number of other neurons through dendrites (branches). The number of possible connection combinations in the brain dramatically exceeds the number of atoms in the universe (Laszlo, 2003). In fact, the number of possible combinations in the brain is 1 followed by millions of zeros. Each individual's unique body and personality is a fascinating wholeness made of this extensive multiplicity. As seen, high-performing individuals in sports and management have a more integrated and orderly brain functioning and a higher level of integrity than average performers. Neurological integration may, therefore, be the basis of what psychology calls an integrated personality, thereby illustrating the significance of 'unity in diversity' (Harung et al., 2009).

A striking example of unity in diversity is provided by a new study, which finds that life's history can be traced to one ancestor. This protein study confirms that all organisms are relatives: A universal common ancestor is at least 10^{2860} times more probable than having multiple ancestors (Theobald, 2010).

A laser beam is characterized by all the photons or light particles being aligned. This dynamic order creates constructive interference (mutual enhancement) and a large potential. As a consequence, a laser beam can move from the earth to the moon and back again without significant loss of potential. In sharp contrast, in an ordinary light the photons move in a random, chaotic way, causing destructive interference (mutual annihilation), thereby resulting in a limited potential. Therefore, just a few meters away from an ordinary source, the light has lost most of its power.

Near absolute zero (–273˚C) certain metals and liquids undergo a sudden transition to a flow of electrons or fluid where there is virtually no friction. This is superconductivity or super fluidity, and again it is due to all the molecules falling into alignment with each other, reflecting unity in diversity.

Management

A high-performing organization is typically characterized by alignment through a shared vision and purpose (Harung, 1999). Collins and Porras (2004) recommend 'preserve the core and stimulate progress', i.e., preserve the vision, core purpose and core values. Alignment facilitates that the associates are working for the common good. On this unified basis, the organization can be more adaptive, dynamic, progressive and successful. Indeed, effective organizations stimulate diversity by encouraging each individual to express her or his unique talents, creativity and initiative. The bigger the diversity in an organization or in society, the more essential is the underlying unity.

In many high-performing companies, the alignment goes further than the vision, purpose and values—the organizational behaviour may also be aligned with the company's strategies, tactics, policies, processes, cultural practices, management behaviours, building layouts, pay systems, accounting systems and job design. Alignment creates many possibilities in comparison to an organization characterized by fragmentation, opposition, friction and conflicts (Collins & Porras, 2004).

World-class performers frequently enjoy a gratifying peak experience when they perform at their very best. In this glimpse of transcendental consciousness (see parallel 1), performance is characterized by least action, effortlessness,

playfulness, deep focus, spontaneous right action and a sense of perfection (Harung et al., 2009; Maslow, 1968). Such moments tend to be related to a particularly high integration of the electrical brain wave activity (Travis, Arenander & DuBois, 2004), thus pointing to unity in diversity.

Parallel 5: Economy—'Do Less and Accomplish More'

Technology

Economy is a general theme in life and nature. Engineers are concerned with improving the efficiency of engines and with using as little materials as possible in buildings. Environmentalists want to reduce the consumption of energy and other resources while maintaining, or preferably even improving, comfort. The interdisciplinary themes are in themselves an example of this principle of economy—the students may learn faster and remember better what is essential in each lesson.

Physics suggests that all known processes in nature follow the 'law of least action'—the principle of minimal expenditure of time and energy (Hagelin, 1987). This law describes the flow of a stream down a hillside, the motion of air in-between the buildings of a city, the movement of a leaf of grass in the wind and the loss of energy from a heated building.

Using a saw in an effective way is also based on least action. The crucial point is not to force, but instead to let the process organize itself in a gentle and spontaneous way. As soon as you start to force, the saw automatically jams and it becomes difficult, if not impossible to continue. A chemical catalyst makes possible a reaction without itself taking part in the process. Thereby, a catalyst goes even further than doing less and accomplishing more and instead obeys the laudable theme, 'do nothing and accomplish everything.'

Management

Everyone instinctly likes the idea of doing less and accomplishing more. In fact, this formula is a good definition of the overall objective of management—to achieve as much creation of value (quality of life, money…) as possible with the least expenditure of human vitality, money, time, energy and other resources. Examples are lean production, just-in-time production, effective delegation and self-management.

A management example of a catalyst is an effective mediator in a gridlock conflict. Or a leader that formulates a great new goal for his/her followers, e.g., John F. Kennedy had the vision of putting a man on the moon and returning him safely to earth, a vision that inspired the whole world.

Parallel 6: Self-organizing

Technology

We locate self-organizing in many forms in nature. Compared to man-made systems (see below), the self-organizing systems in nature go further, i.e., a higher degree of perfection and autonomy is achieved:

- We have delegated to our autonomous nervous system the billions of processes that continuously take place in our body, e.g., cardiovascular, respiratory and digestion systems.
- In the sheet of paper that you now hold in your hand, the elementary particles are

whirling around at almost the speed of light, without the need for any intervention from your side.

- In the observable universe there are billions of galaxies, and in each galaxy there are around 100 billion stars (Laszlo, 2003). All these 'cosmic balls' fly through space at enormous speeds, without colliding.

Management

Extensive self-management or self-organizing may lead to enhanced individual and collective performance (Collins & Porras, 2004; Harung, 1999). This improved performance through less control is a further example of the theme, 'do less and accomplish more.' In its ultimate consequence, we may with a little humour say that self-management is MBA—'management by absence' or 'management by automation' (Harung, 1999, p. 253).

There are further examples of self-organizing in man-made systems. Society seems to a large extent to be self-organizing since the interventions by politicians often appear to have little effect, i.e., despite huge expenditures there have so far been little improvements in crime prevention and social rehabilitation. The global monetary market, the stock market, the commodity market, the global telephone network and the energy market (to the extent that it has been deregulated) are further examples of man-made self-organizing systems.

Parallel *7*: Ease of Communication

Technology

Heat conduction: A thinner wall results in more energy flowing through, and at a higher speed. Flow of electricity and Ohm's law: The shorter a conductor is, the more current is let through, and the quicker it takes. The frontal lobes—the CEO of the brain—are directly connected virtually to all parts of the brain, which means that communication is quick between where the decisions are made and where the action is initiated.

Management

Today, there is a move away from tall hierarchical organizations—with many levels between the top and bottom—to flatter network-like, value-rich organizations. This shift typically results in improved communication in terms of quality, quantity and speed. In this context, middle management has jokingly been called the 'Rockwool layer.' As seen, the brain is functioning like a flat, network-based organization, where the CEO is in frequent direct contact with almost all associates, e.g., 'management by walking around'.

Parallel 8: Feedback

Technology

Feedback is central to self-organizing systems, and is found in mathematics, information technology, electronics and engineering, in the form of, for example, loops and iteration (Latin for 'ploughing again'). During the process of iteration, the mathematical analysis of a non-linear system goes through repeated improvements and gradually converges on the final, desired solution, equilibrium, or steady state (assuming that the system is stable).

A fridge, radiator, or heat pump regulate the temperature through feedback, and while you read these lines, millions of feedback processes

are taking place in your own body to preserve homeostasis in all of your 50 trillion (50 million million) cells.

Management

Customer satisfaction surveys, focus groups, market research and accounts are examples of feedback systems used in business and industry, while elections and opinion polls similarly influence politics, public administration and society. Feedback is central to education, for example, through reflection, discussions, assignments and examinations. Basically, there are two complementary approaches to decision making, two processes that both involve feedback. First, during outer-directedness we gain knowledge from other persons or the environment. Second, inner-directedness or self-referral is where we go inside ourselves (intuition, feelings…) for information and decisions.

Parallel 9: Symmetry

Technology

Symmetry is generally present in nature and in technology. The human body, flowers, fruits, leaves, straws, and snow and mineral crystals are but a few examples. The structure of an atom is symmetrical as is an I-beam, H-column or tube in structural engineering; the body of an aeroplane; the stiffness matrix that relates a structure's loads to its deformations (in fact, also when the structure is asymmetric); furniture; the mind–body relationship; and the earth's orbit around the sun. A mirror simple reflects what is put in front of it.

Any mathematical equation (e.g., $E = mc^2$) represents symmetry, since the right-hand side is equal to the left-hand side. Within mechanics, Newton's law states that

Reaction = Action

For a dynamic system this law takes the form, '$F = ma$', where 'F' is the force, 'm' the mass of the object, and 'a' its acceleration. In information and communication technology, we also find symmetry since the quality of the output depends on the quality of the input, and our health is to a large extent determined by what we eat.

In unified field theory, the word symmetry is used to describe the unified field, and the creation of multiplicity from this united platform is called 'spontaneous sequential symmetry breaking' (Hagelin, 1987). Daniel Freedman at MIT, a leader in unified field theories, writes,' To begin with, the equations in the theories have in themselves a high degree of symmetry, and if there is one thing theoretical physics has learned in the twentieth century, it is that symmetry is one of the major principles of successful theories' (Oates, 2002, p. 109).

Management

We find symmetry also in the science and art of management. Accounting is symmetrical since debit has to equal credit. Tor's law states that 'trust generates trustworthiness,' and implies that if you give a person trust, it substantially increases the chances that he will behave ethically towards you (Harung, 1999).

Any fair business transaction represents symmetry between price and value, while 'top-down pricing' and fraud represent asymmetry. A win-win solution suggests that an interpersonal interaction is symmetrical. The same applies to the reciprocity principle in behaviour: 'Do to others what you want others to do to you'; the Golden Rule of Jones of Toledo, 'What I want for myself, I want for everybody'; and 'giving is the

basis of receiving.' These themes are the essence of sound ethics.

The law of acceleration, $F = ma$, is similar to the force (inspiration, money and other resources) needed to initiate and accelerate a project, campaign or business, and again reflects symmetry, as does 'supply and demand' in economics.

Symmetry is also the theme of investment—first you give and then you (hope to) receive. In fact, symmetry is the least acceptable return on investment—what you really hope for is *asymmetry* where you get back much more than what you put in! Furthermore, symmetry applies to the relationship between a leader and his or her followers in that they both depend on each other to create results:

Followers need leader ⇔ Leader needs followers

Whereas media and literature are full of writings about the left-hand side of this equation, considerable less attention is given to the right-hand side. When CEOs of the largest corporations on the average earn 450 times their workers, as is the case in the US today, it seems that the right-hand side has been overlooked.

Parallel 10: Simple and Beautiful

Technology

Many of the scientists who have fundamentally advanced human knowledge and understanding have been looking for simplification and beauty. In fact, physicists and mathematicians often talk about mathematical equations that are beautiful and elegant. Says James Watson on discovering the highly symmetrical double helix of the DNA: 'It was so pretty, it had to be true.' The many examples of symmetry given above illustrate this elegance, simplicity and harmony that we find inherent in nature.

Management

Successful businesses are constantly looking for solutions that are simple, practical and effective—and therefore also beautiful. Perhaps one of the reasons for the many dot.com failures a few years ago was that their products did not make life simpler for the users? Most pieces of art and music are appreciated for their beauty.

Parallel 11: Whole Is More Than the Sum of Parts

Technology

A principle closely related to unity in diversity is the theme from systems theory that the whole is more than the collection of parts. In the parallels between management and technology presented earlier, this theme was illustrated using the coherent dynamics of a laser beam, as described in quantum physics. There are also examples of coherence from the biological sciences:

> …when the energy flowing through the cell reaches a certain critical level, all the cell wall molecular dipoles begin to 'line up', or come into phase. They begin to oscillate in unison, as though they were suddenly coordinated. And when they oscillate in unison, the microwave that each generates independently suddenly gets pulled into one single coherent quantum microwave field. This emergent...coherent field has the holistic properties common to any quantum field. (Zohar & Marshall, 1994, p. 79)

There are many other examples in engineering and technology of the theme that the whole is more than the collection of parts. A home is obviously

much more than scattered heaps of various building materials, such as bricks, cement, wood, wires and pipes. A PC is a precisely structured whole that is made up of a large number of highly specialized components that have to be put together in an extremely accurate way.

Management

It is the 'collective consciousness' that primarily governs any social system, whether a team, family, organization, nation or the whole world (Harung, 1999, Chap. 8). The collective consciousness is seen as the aggregate social reality created by all members, where each individual is contributing in a more or less constructive way. A creative and coherent social entity has a high collective consciousness—as expressed in more harmonious and productive behaviour—while a fragmented and problem-ridden human system has a low aggregate consciousness. If collective consciousness is the prime mover of any social system, then it follows that the leader is a reflection of this overall level of consciousness:

$$\text{Leader} \Leftrightarrow \text{Collective consciousness}$$

This principle is another example of symmetry. It implies that an organization gets the leader it deserves (Harung, 1999; Harung et al., 2009). The managers of visionary companies seem to enact this theme since they generally do not put primary emphasis on promoting themselves and on being a high-profile leader (see earlier). Instead, they focus on building a healthy organizational culture that will prosper far beyond their own tenure (Collins & Porras, 2004). This principle of leaders not promoting themselves is also expressed in traditional Chinese thinking, 'A leader is best when we hardly know he exists. When his work is done, his aim fulfilled, his followers will say, "We did it ourselves!"'—Lao Tzu.

Educational Outcome

Oslo University College

Even though the students took only one interdisciplinary course, the overall impression is that it had an effect in terms of reflection and perspective. This conclusion is based on four types of student feedback:

1. One question relating to reflection has been included when, at the end of the course, students are invited to participate in a standard, anonymous and written course evaluation as part of the quality assurance programme at Oslo University College. Table 2 summarizes the response

Table 2
Response to a Question on Enhanced Reflection from Student Evaluation of Management Course

Score (%) / *Year*	*Very Little*	*Little*	*Somewhat*	*Much*	*Very Much*
2006	4	9	23	47	17
2007	2	7	29	38	24
2008	3	6	24	43	24
2009	8	9	21	48	14
Average	4	8	24	44	20

Source: Developed by the author.

to the one question (out of many): 'Has the course stimulated your own reflection?' during the spring semesters of 2006–2009. The responses are fairly consistent for all four years. Since about two-third reports a positive experience, an acceptable goal attainment is suggested.

2. The above questionnaire also invited open-ended feedback from the students. The teaching assistant, who analyzed the responses, concluded in, for example, 2006: 'The majority of the students are of the opinion that the course has turned out to be much more thought provoking than what they had expected. Quite a number of students have started to reflect more about their own life and work experience. Some have also started to follow media more closely.'
3. During the spring of 2009, the response to the assignment on interdisciplinary themes resulted in considerable creativity. One group wrote that management and aerodynamics have 'upliftment' in common (we can add 'reducing friction'). Another group thought that management, jazz and football—all were characterized by 'improvisations on rehearsed themes' (the same applies to the traditional ghandarvaveda music of India).
4. In 2009, a student survey was administered at the beginning and end of this course and a smaller, parallel and more traditional course on management and ethics at Oslo University College was conducted. The students were asked to respond using a Likert scale from 1 (very little) to 5 (very much) on the following two questions:

    a. *Perspective*: To what extent has your college education contributed to your seeing connections and parallels between different disciplines and courses?

    b. *Reflection*: To what extent has your college education contributed to your independent thinking and reflection?

The response is summarized in Table 3. Although a statistical analysis was not possible, the results indicate a trend that the course with interdisciplinary parallels was most effective in stimulating student reflection and perspective.

Table 3
Change in Student Reflection and Perspective from Beginning to End of Two Parallel Management Courses

	Change in Score for Perspective (%)	*Change in Score for Reflection (%)*
Course on value-based management	**+3.0**	**+2.2**
Parallel management course	**+1.3**	**–6.3**

Source: Developed by the author.

Maharishi University of Management

At Maharishi University of Management in the US, interdisciplinary principles are one of the several approaches incorporated in every lesson to enhance qualities like independent thinking, overview and intercultural understanding in the students. National Survey of Student Engagement and American College Alumni Testing have shown that compared to the norm, MUM students in general score higher (MUM, 2003). Examples are as follows:

- Putting together ideas or concepts from different courses in assignments or class

discussions (norm: 71 per cent, MUM: 81 per cent).
- Had serious conversations with students of a different race or ethnicity than your own (64 per cent to 88 per cent).
- Had serious conversations with students who differ from you in religious beliefs, political opinions or personal values (66–82 per cent).
- Understanding yourself (75–99 per cent).
- Developing personal code of values and ethics (68–91 per cent).
- Prepare you well for your continuing education (12–66 per cent).
- Prepare you well for your present occupation (29–64 per cent).
- Prepare you well for working cooperatively in a group (43–78 per cent).
- Prepare you well for caring for your own physical and mental health (22–86 per cent).

Conclusion

This article has described a course on management and ethics for students of technology. This course addresses the need for a wider and more integrative outlook to augment specialized knowledge. Three main strategies to stimulate reflection and perspective have been incorporated in the course: (*i*) the importance of sound human values for high performance and well-being, (*ii*) the manifold management realities of different national cultures, as exemplified by the East–West diversification, and (*iii*) a number of interdisciplinary parallels that connect social sciences and natural sciences. Feedback from the students supported this more holistic approach. Other professors can choose their own parallels to augment their teaching. This integrated approach can be applied to any work setting, and to the teaching of any vocation or discipline at all levels of education.

NOTES

1. To a less degree this also applies to the West, e.g., philosophers like Hegel, Spinoza and Grundvig.
2. 10^{80} = 1 0000000000 0000000000 0000000000 0000000000 0000000000 0000000000 0000000000 0000000000 atoms in the visual part of the universe.

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