Technology, Knowledge, Culture, and Management: the keys to success

Abstract

The shift from industrial societies to information societies requires attention to changing resources which may be the keys to success: technology, knowledge, culture and management. Organizations employ technology with the goal of improving efficiency and reducing operational costs. Hence technology structures within organizations must be addressed. Who should comprise the best teams which can best ensure organizational success? How can technological innovation be best integrated with organizational innovation? Management culture must be changed and seamlessly integrated with technological advancement and cultural diversity. How can knowledge be employed to effect such changes most efficiently?

Organizational structure has a profound impact on IT function and success. There is a constant tension between IT as "the change agent" and its objects of change within an organization. Rigid organizational structures seem to have difficulties in embracing technology while flexible organizations seem to have more success in employing it in a positive way.

Technology, Knowledge, Culture, and Management: the keys to success

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Today, we are in the midst of a paradigm shift—from an Industrial Society to the Information Society. In the Information Society, information and knowledge have become the most fundamental economic resource. In the Industrial Society, labor, land and capital were the basic economic resources; however, today, knowledge, culture, management and technology are the key resources, rather than just factors.

With the rise of information technologies and electronic networks, knowledge-building and culture alignment activities among organizations in the interconnected networks are more important than any other time in history and have become the key to success and wealth. In this new environment, the ability to efficiently and effectively deal with information is a competitive advantage for businesses. Over time, businesses have tried to reduce the costs of technology. Before the advent of information technologies, bureaucratic hierarchies and vertical integration were thought to be the most effective way to reduce operational costs. However, as information technologies have enabled firms to reduce operational cost even more efficiently than such hierarchical structures, businesses are now attempting to reorganize their technological structures. Many companies shifted from just having an IT department to becoming technology-driven companies.

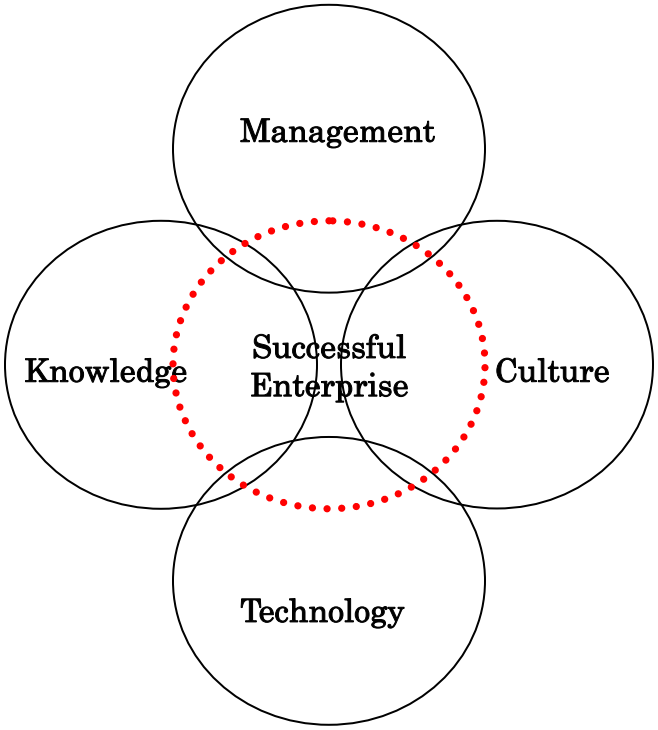
These new organizational structures are more flat, flexible and responsive to environmental changes. Firms now collaborate and construct strategic alliances, which exploit the “strength of loosely coupled ties” between units. Most of those companies

face difficult questions as to how to make their technology core teams more effective and more productive. This paper looks into one of the most popular misconceptions namely that “by hiring the best people the company will create the best team”. Lack of organizational culture and a clear image of who comprises “the best team” can lead to high turnaround rate, over committing of finance, time and loss of employees' confidence. The following questions should be addressed: Who are the architects and engineers? Why do we need them to ensure success? What are their primary responsibilities? Can I hire a good developer who can do all of this and be a project manager as well? Should all personnel be experienced seniors or can money be saved by hiring one really good senior person and ten juniors?

Technological progress leads to economic development by raising firms' productivity and this creates better quality of life for everyone. However, investment in technology does not always reach the expected level of productivity and quality of life.

A main reason for technological investment failure is the current trend of overlooking the fact that well organized human resources are a major requirement and a main factor for obtaining the highest profits from the potential of technology. Thus, technological and organizational innovation must go hand in hand [1]. The Oslo Manual [2] recognizes both the importance of the organizational dimension of technological innovation and that technological change and organizational change are closely coupled, it exclusively addresses technological innovation. In addition, the Oslo Manual recognizes organizational and managerial innovations as a complex topic, and it strongly recommends the creation of indices to assess non-technological innovations, in order to include them in future studies. However, those issues and questions are not uniquely related to technological units of a company, they are raised across the board in all

business units of companies, in all companies and in all industries.



Given both the widely recognized importance of the organizational dimension of innovation, and the need for more detailed research into organizational and management culture, this paper is an attempt to contribute to the knowledge of this aspect. The main factors in making company successful in today's rapidly changing global economy are full and seamless integration of the four key factors: ***Technological innovation; Management Culture; Change and Business Knowledge and Organizational culture***. To embrace the knowledge about this domain we try to provide a better understanding of organizational and managerial factors, which should work together to create and reinforce the kind of environment that facilitates technological innovation and enables organizational culture to succeed. What do you suppose most successful business leaders say about their goals and strategies and what keeps them awake at night? How do they manage gigantic corporations spanning many national cultures in the New Economy? [3]

Jack Welch, chairman and CEO of General Electric recently gave a talk to the MBA students at Yale explained that his strategy for GE was to create an organization without any boundaries, a culture in which ideas flowed freely from the division that made aircraft parts to the one that made light bulbs, from the subsidiary in Shanghai to the one

in Cincinnati. [3]. Effective management is the key to a successful enterprise. It is well known fact that organizations fail because managers fail. There are many factors why managers fail. There are many factors which contribute to that failure. Research has shown that there are as many as 35 types of factors which could be potential causes of unsatisfactory performance by managers.[6] In the absence of concrete figures on managerial "malpractice," it is difficult to estimate the number of managers who fail in their primary responsibilities to organizations. These are generally accepted as four-fold: *Planning, Organizing and Staffing, Leading, and Controlling.* To avoid short-term corporate success that increases the chances of long-term failure, managers need to learn how to sustain incremental change while simultaneously leading to revolutionary change. Great managers are architects, network builders and jugglers. They understand how to employ these roles to foster a culture that celebrates stability and change in order to ensure success tomorrow. [4]. In competitive, technology-driven and very intense markets, competitive advantage can only be built through a combination of different types of innovation (product innovation, incremental, architectural as well as discontinuous innovation) [5]. Senior Vice President of Intel Les Vadasz said once, "People look at organizational change and conclude, "Somebody did something wrong." That's ludicrous because there's absolutely no reason why an organization created two years ago has any relevance to the organization needed two years hence. The beauty of the current and future business world is that the technology will always change (and thus) the organization, the interfaces, the customer interfaces, and the vendor interfaces are always going to change, because of the technology"

Impact of Organization Structure

The selection of an organizational structure for the information technology (IT) function is a multi-tiered issue encompassing the IT function as well as the larger enterprise. The selected option should support the following dynamics:

1. The structure must enable the internal IT function to maintain and expand its technical expertise as knowledge workers – an inward looking role – while performing the service provider role – a role with an external focus. These roles have traditionally looked to different supporting structures.

2. IT is often charged with a "Change Agent" function in the organization and this role creates new tensions between the agent and the objects of change. This tension can have an adverse impact on the core service provider function and create internal conflicts as well.

3. Technology has a profound impact on the overall organization structure and all four components of the relationship must be continually rebalanced. Leavitt[1] has presented the four pronged model of task arrangements, structures, people, and technology and shown how changes in technology accelerate changes in the relationships.

4. Much of the productive work in IT is accomplished through projects of an interdisciplinary nature that often require temporary, problem-oriented project groups.[2] In addition to reliance on the organization's basic structure, different projects will exhibit the

[1] Leavitt, Harold J., "Applying Organizational Change in Industry: Structural, Technological, and Humanistic Approaches." In *Handbook of Organizations*, edited by James G. March. Chicago: Rand McNally (1965).
[2] Holt, Knut, *Innovation: A Challenge to the Engineer*, Oxford: Elsevier, 1987

characteristics of the matrix organization[3], the venture team[4] [5], and/or the independent organizational structure within the larger framework.

Mintzberg[6] has postulated four basic organizational structures that occur with varying frequencies depending on the type of company and industry. They are (1) the entrepreneurial structure, (2) the machine bureaucracy, (3) divisionalized bureaucracy, and (4) an adhocracy. Applegate[7] has categorized these characteristics into three more general categories: Hierarchy, Entrepreneurial, and Networked with detailed explanations of their applicability to IT functions. These basic types will be evaluated against the four sets of dynamics enumerated earlier.

The issue of culture and how that underlying fabric present in every organization – be it business or social – impacts the selection and effectiveness of different structures is a key determinant of its effectiveness. One area where this is readily apparent is in the empowerment of service workers. One must consider the production line approach which applies manufacturing logic and tactics[8] as well as the empowerment approach which focuses on a more humanistic approach and aims to "dehumiliate" work.[9] The advantages and disadvantages must be evaluated relative to the culture at hand before an approach is selected.

We will begin by evaluating the basic organizational types and then propose a methodology for relating them to the specific forces acting on IT organizations. The second step will include a proposed approach to linking the IT structure to the overall

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culture and overall organization type. How can one increase the likelihood of positive reinforcement between the "micro" IT function and the "macro" organization using appropriate organizational "typing?" Does the set have to be consistent throughout the enterprise? How should one measure success? We will present a roadmap for exploration and determination.

Culture, and Management

We are all aware that improvements in technology resulting in better communications and transportation systems are making the world a smaller place. Not only do diverse people, products, methods, cultures become more visible and available, but there are increased opportunities for indirect and direct contact with these cultural diversities. Indirect contact with cultural diversity is facilitated via improvements in telecommunications, including voice, video, and diverse multimedia systems such as the advent of the world wide web, fax, pdas, personal computers, email, etc. Direct contact is facilitated by increased travel opportunities via improved transportation systems including highways, waterways, rail, and air (Kopec, 1997).

Coincident with the advent of the WWW (around 1993) was the dissolution of Communism around the world. These two factors coupled with the technological advances discussed above probably contributed more to the

awareness of cultural diversities than any other factor. Hand in hand with knowledge of cultural diversity is the knowledge about differences amongst management styles from different countries and cultures. The line between "cultural/racial profiling" and simply being "knowledgeable about cultural differences" is a fine one. Nontheless, the world has considerable history behind it, and if we can't draw upon the lessons learned from history and precedent where would we be? The ideas in the following section of our paper are largely based on the research of Professor Geert Hofstede, exposited in his wonderful paper "Cultural Constraints in Management Theories (Hofstede, 1993).

Background

The earliest use of the term "management" is attributed to Shakespeare's "Love's Labour's Lost," dating to 1588, in which Don Adriano de Armado, "a fantastical Spaniard," exclaims (Act I, scene ii, 188):
"Adieu, valuour! rust , rapier! Be still, drum! For your manager is in love; yea, he loveth."

The word has Latin roots from "manus", hand, via the Italian maneggiare, the skill training of horses in the manege; this has subsequently been

extended to general notions of skill handling, in terms of arms, musical instruments, and even people. In French, ménage, means “household” and is equivalent to “husbandry” in terms of running a household.

Later, Scotsman Adam Smith, the founder of the science of economics, in his Wealth of Nations (Smith, 1776), refers to “manage” and “management” in terms of the process and persons involved in running joint stock companies. The British economist John Stuart Mill (1806 – 1873) continued the use of the term in this sense, particularly with reference to hired persons who note driven by ownership – could not be trusted. To Americans management refers to a class of people who 1) do not own a business but sell their skills on the behalf of owners and 2) do not produce personally but are indispensable for making others produce, particularly through motivation. Frederick W. Taylor is the American credited with the first notions of scientific management in his work “The Principles of Scientific Management” (1911). His theories became known as “Taylorism” which looks at Management as a “systems science” which has a number of independent parts that can be analyzed, studied, and improved as contributors to a working system as a whole.

In modern times managers have been ascribed four major responsibilities: 1) Planning 2) Organizing and Staffing 3) Leading and 4) Controlling. Perhaps the greatest distinction in modern times in managers' roles with those of yesteryear is the role of middle management. Middle managers today have tremendous responsibilities. Their main role is to serve as a link to the needs top-level and low-level managers. Middle managers must be very well educated (typically MBA), have excellent technical skills, product knowledge, political skills in addition to dealing with the public, and general people skills. Our next section will explore these differences amongst management of different cultures.

Cultural Dimensions

Professor Geert Hofstede of the University of Limberg in Holland has studied the relationship between culture and management across five dimensions at 64 national subsidiaries of the IBM Corporation (Hofstede, 1993). He considered people working for the same multinationals, but in different countries as representing very well-matched samples from the populations of their countries, "similar in all repects except nationality." The dimensions which Professor Hofstede evaluated in this study were:

1) Power Distance – the degree of inequality among people which the population of a country considers as normal: from relatively equal (that is, small power distance) to extremely unequal (large power distance).
2) Individualism - the degree to which people in a country prefer to act as individuals rather than as members of groups. The opposite notion to this is "Collectivism" in which there is low individualism (but no political notions are intended here). In collectivist societies children maintain a high degree of respect for the members of their group (usually the family) and children effectively distinguish between in-group members and out-group members. When such (Collectivist Society) children group they tend to remain loyal to their groups throughout life. In contrast, in individualist societies, a child learns early on to think of himself/herself as "I" as opposed to "we". This is consistent with the child's expectation that one day it will be on its own two feet, rather than relying on a group for support and protection.
3) Masculinity - and its opposite pole Feminity. It is the degree to which tough values like assertiveness, performance, success and competition, which nearly all societies are associated with the role of

men, prevail over tender values like the quality of life, maintaining warm personal relationships, service, care of the weak, and solidarity, which in nearly all societies are more associated with women's roles.[10]

4) Uncertainty Avoidance – the degree to which people in a country prefer structured over unstructured situations. In structured societies the rules to how one should behave are clear, well-known and may be written down, or may just be part of tradition. In countries where this dimension scores low, people tend to be more easy-going, while in countries where this dimension scores high people tend to exhibit more nervous energy. A society with more uncertainty avoidance tends to be more rigid, while one with less uncertainty avoidance tends to be more flexible.

The findings of Professor Hofstede across these four dimensions which we will summarize shortly, concurred with those of Michael Harris Bond, a Canadian working in Hong Kong. Hence in order to counterbalance a possible "Western bias" introduced by the

[10] Hofstede adds "Women's roles differ from men's roles in all countries; but in tough societies, the differences are larger than in tender ones. While this may have been true for many centuries, we feel compelled to note that the iconoclastic roles attributed to gender are changing. Clearly, women's roles in the homes and the job market around the world are changing, although changes in this dimension may be less evident in "tough" societies than in "tender" ones.

background of the researchers, Bond produced a questionnaire with a deliberate "Eastern bias." At Bond's request, his Chinese colleagues produced the Chinese Value Survey (CVS) which was translated from Chinese into different languages and answered by 50 male and 50 female students in each of 23 countries in all five continents.

Analysis of the CVS data produced three dimensions akin to the three dimensions of the IBM / Hofstede study. The fourth dimension, however replaced "Uncertainty Avoidance" with ideas that were rooted in the teachings of Confucius, namely Long-term versus Short-term Orientation. Long-term thinking includes values oriented towards the future, like thrift (savings) and persistence. Short-term thinking was exemplified by values oriented towards the past and present, like respect for tradition and fulfilling social obligations (ibid). Hence the five dimensions analyzed and reported by Hofstede were: 1) Power Distance 2) Individualism 3) Masculinity 4) Uncertainty Avoidance and 5) Long Term Orientation.

Cultural Management Propensities

The table below (based on Hofstede, 1993) presents findings for seven nationalities:

Country	Power Distance	Individualism	Masculinity	Uncertainty	Long-Term Orientation
USA	**40 L**	**91 H**	**62 H**	**46 L**	**29 L**
Germany	**35 L**	**67 H**	**66 H**	**65 M**	**31 M**
Japan	**54 M**	**46 M**	**95 H**	**92 H**	**80 H**
France	**68 H**	**71 H**	**43 M**	**86 H**	**30 (*) L**
Netherlands	**38 L**	**80 H**	**14 L**	**53 M**	**44 M**
Russia	**95 (*) H**	**50 (*) M**	**40 (*) L**	**90 (*) H**	**10 (*) L**
China	**80 (*) H**	**20 (*) L**	**50 (*)**	**60 (*) H**	**118 H**

Key: H = Top Third; M = Medium Third; L = Bottom Third (among 53 countries and regions for the first four dimensions; among 23 countries for the fifth dimension.

Let us translate theses findings briefly. US management profile indicates below average on power distance and uncertainty avoidance, highly individualistic, fairly masculine, and short-term oriented; Germans, in contrast show stronger uncertainty avoidance and less extreme individualism; The Japanese show distinct numbers on all dimensions, but least significantly a difference on power distance; greatest differences with Germany and USA occur in terms of Long Term Orientation, Uncertainty, and Masculinity. French managers show a larger power distance and uncertainty avoidance but are less individualistic and somewhat feminine;

The Dutch resemble Americans on power distance, individualism and masculinity, but are score extremely feminine and are relatively long-term oriented. Russian managers are hypothesized to have great power distance moderate individualism, low masculinity, very high uncertainty, and very low long-term orientation. Finally the Chinese Managers are very high on power distance, high on uncertainty avoidance, and very high on long-term orientation.

Professor Hofstede concludes:

"Culture can be compared to a forest, while individuals are tree. A forest is not just a bunch of trees: it is a symbiosis of different trees, bushes, plants, insects, animals and micro-organisms, and we miss the essence of the forest if we only describe its most typical trees. … There is a tendency in the U.S. management literature to overlook the forest for the trees and to ascribe cultural differences to interactions among individuals."

We find this rather surprising when we consider that Americans are considered to be the nation which represents the greatest melting pot amongst nations in the world. Naturally, the interactions between managers with such diverse cultural roots must be quite complex.

The above known cultural differences in management style will also be presented, emphasized, and examined through multimedia, interactive, web-based educational software. Using a common design framework as a basis, we will develop short, interactive, skits, which will illustrate, highlight, question and test students' knowledge of these differences. These skits will be based on research of the kind described above on management and culture.

Examples of cultural managerial tendencies will include: the technical expertise of German managers, the reliance of Japanese managers on a consensus before making a decision, and their more formal, businesslike nature, as compared to their American counterparts who are viewed as relatively individualistic and casual. French managers are part of an elite class, and behave in a superior, authoritarian manner, while Dutch managers emphasize equality and consensus. The overseas Chinese management working on the Pacific Rim is typically perceived as being represented by one dominant person quite often of advanced years, yet maintaining a low profile.

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