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IMPLEMENTATION OF TRIZ METHODOLOGY IN HUMAN CAPITAL

Master Thesis

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ABSTRACT

IMPLEMENTATION OF TRIZ METHODOLOGY IN HUMAN CAPITAL

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Globalization is the key term of today and it drives companies for worldwide competition. In order to build and sustain competitive advantage, the knowledge becomes a critical strategic resource and this perspective places staffs into the heart of the organizations. Numerous studies have defined the elements of Human Capital practices and organizational performance.

Motivation of this study is to create an inventive guide for today's human capital professionals with TRIZ methodology. TRIZ is a problem solving, analysis and forecasting toolkit which is first used in technology and engineering. But recently, within last few years, several TRIZ experts started to extend application of TRIZ techniques to business and management problems and tasks.

In this study, in order to identify HCM problems, 19 key concepts had been chosen as contradiction parameters. Furthermore 40 inventive parameters has been identified along with examples. Descriptive metrics has been given for some parameter examples and finally 19X19 matrix has been created. The guide which is introduced in this thesis may provide a useful methodology for solving intangible problems in human capital issues.

Keywords: Human Capital Management, TRIZ, Management-TRIZ

ÖZET

İNSAN SERMAYESİ KONUSUNDA TRIZ METODOLOJİSİNİN UYGULANMASI

Ersin, Füsun

Endüstri Mühendisliği
Tez Danışmanı: Yrd. Doç. Dr. F. Tunç Bozbura

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Küreselleşme günümüzün kilit kavramıdır ve dünya çapında rekabet için şirketleri zorlamaktadır. Rekabete dayalı avantajları olusturup sürdürebilmek için bilgi kritik bir stratejik kaynak haline gelmiştir ve bu bakış açısı tüm personeli organizasyonların kalbinde yer alacak hale getirmiştir.

Bu araştırmanın amacı, TRIZ metodolojisi ile günümüzün insan sermayesi profesyonellerine bir rehber yaratabilmektir. TRIZ, ilk olarak mühendislik ve teknoloji alanlarında kullanılan, bir problem çözme, analiz etme ve tahmin yürütme aracıdır. Fakat son zamanlarda, özellikle son bir kaç yılda, bir takım TRIZ uzmanları, TRIZ tekniklerinin uygulama alanlarını iş ve yönetim problemlerini de kapsayacak şekilde genişletmiştir.

Bu çalışmada, 19 adet anahtar konsept, HCM (Insan sermayesi yönetimi) problemlerini tanımlayabilmek amacıyla çelişki parametreleri olarak seçilmiştir. 40 adet yaratıcı parametre örneklerle tanımlanmıstır. Bir takım parametre örnekleri için tanımlayıcı ölçümler verilip sonunda 19X19 matriks yaratılmıstır.Bu tezde tanıtılan rehber, insane sermayesi konularındaki soyut problemleri çözebilmek için yararlı bir metodoloji sağlayabilir.

Anahtar Kelimeler: Insan Sermayesi Yönetimi, TRIZ, TRIZ-İşletme

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1. INTRODUCTION

In our ever-changing world, global competition is increasing steadily and there is a shift towards knowledge based work enabling information technology, and other related factors. In this context; companies have to face several kinds of Human Resource and Human Capital Management problems. To analyze those problems, thousands of texts published every year regarding Human Resources and Human Capital management. But the biggest handicap is time. Managers do not have time to resort these resources in order to develop their system. TRIZ methodology is an inventive tool to analyze these researches and design a guide for managers.

"TIPS" is the acronym for "Theory of Inventive Problem Solving," and "TRIZ" is the acronym for the same phrase in Russian. TRIZ is a powerful methodology, based on empirical data that can provide solution concepts for wide range of problems which were developed by Genrich Altshuller in 1946. Altshuller defined an inventive problem as one containing a contradiction. He defined the contradiction as a situation where an attempt to improve one feature of the system detracts from another feature.

While the Matrix for Technology and Engineering was originally developed by Altshuller in the 1960s, TRIZ methodology was used in several subjects. Although Human Resource and Human capital has not been inspected before. Some of the others are;

- TRIZ in School Distirict Administration (Hooper, Aaroni Dale, Domb, 1998)
- TRIZ and Politics (Klementyev and Faer, 1999)
- 40 Inventive (Business) Principles With Examples (Mann and Domb, 1999)
- Business Contradictions - Mass Customization (Mann and Domb, 1999)
- Management Response to Inventive Thinking - (TRIZ) In a Public Transportation Agency (Skrupskis and Ungvari, 2000)

- TRIZ Beyond Technology: The theory and practice of applying TRIZ to non-technical areas (Zlotin, Zusman, Kaplan, Visnepolschi, proseanic, malkin, 2001)
- 40 Inventive Principles with Social Examples. (Terniko, 2001)
- Using TRIZ to Overcome Business Contradictions: Profitable E-Commerce. (Mann and Domb 2001)
- TRIZ-based Innovation Principles and a Process for Problem Solving in Business and Management. (Ruchti and Livotov, 2001)
- 40 inventive principles with applications in universe operations management. (Filkovsky, 2003)
- 40 inventive principles with applications in service operations management. (Zhang, Chai, Tan, 2003)
- Empowering Six Sigma methodology via the Theory of Inventive Problem Solving (Kermani, 2003)
- 40 Inventive Principles in Quality Management (Retseptor, 2003)
- The 40 inventive principles of TRIZ applied to Finance. (Dourson, 2004)
- 40 Inventive Principles in Marketing, Sales and Advertising (Retseptor, 2005)
- Application of Theory of Inventive Problem Solving in Customer Relationship Management (Movarrei and Vessal, 2006)
- How to Reduce Cost in Product and Process Using TRIZ (Domb and Kling, 2006)
- Theory of inventive problem solving (TRIZ) applied in supply chain management of petrochemical projects (Movarrei and Vessal, 2007)
- Systematic improvement in service quality through TRIZ methodology: An exploratory study (Su, Lian, Chiang, 2008)

In this study two dimensional contradiction matrix is used for solving the problem. These contradictions are employee satisfaction, employee motivation, human capital, management leadership, knowledge sharing, employee commitment, value alignment, structural capital, process execution, knowledge integration, training, retention of key people, relational capital, knowledge generation, business performance, skills and

competences, strategy execution, innovation capability, culture and values. In an organization there are many kinds of conflicts about human capital and TRIZ shall be a suitable method to solve these conflicts.

In section II, a detailed discussion of Human capital Management and Human Resource Management is provided. A summary of recent research papers related to selected Human capital Management and Human Resource Management is presented.

Human Capital TRIZ implementation is introduced in section III. Firstly, 40 Inventive Human Capital principles with examples are introduced as solution set. Then, descriptive metrics of some principle examples are given to help measurement of these principles. Finally, 19X19 TRIZ Matrix is introduced to complete the implementation.

The thesis ends with a Conclusion and Future Research which are provided in section IV.

2. LITERATURE REVIEW

2.1 HUMAN RESOURCE MANAGEMENT AND HUMAN CAPITAL MANAGEMENT

Human Capital management holds that business profits are generated and sustained when a company provides products and services that meet customers' needs better than competitors do–in other words, when the company has a competitive advantage. Business create and maintain that advantage over time when their core competencies, or the activities that customers value most, are superior to those of their competitors in the eyes of their current and potential customers. Human Capital Management is a system for improving the performance of those in critical roles–those with the biggest impact on corporate core competencies (Hall, 2008; 4). HCM is a subset of HR. It is system for enabling the business to meet its short-term and long-term business objectives by improving the performance of those in critical roles (Hall, 2008; 24). Hall pointed out that; it is time for a new, systemic approach to growing human capital. This is an approach that; (1) clearly describes what successful human capital is and how it connects to business results, (2) measures and manages human capital with the same discipline as financial capital, and (3) enables company managers to learn from experience to make progressively better human capital decisions. It is time for Human Capital Management (HCM)–a system designed to create sustained competitive advantage through people (Hall, 2008; 3). The model proposed in Bozbura, Beskese and Kahraman's study consists of five main attributes, their sub-attributes, and 20 indicators. The results of the study indicate that "creating results by using knowledge", "employees' skills index", "sharing and reporting knowledge", and "succession rate of training programs" are the four most important measurement indicators for the HC in Turkey. (Bozbura, Beskese, Kahraman, 2006). Altough, the results obtained show the situation of HC in Turkey, this model is valid for any country.

The ways in which HR becomes "bottom-line" vary depending on a company's strategic objectives. Traditional HR responsibilities, such as training, compensation and performance management, are linked to tangible business goals and measuring the contribution to those goals (Phillips, 1996; 2). The primary purpose of HCM is to make external customers and shareholders happy–not to make internal customers (such as employees) happy. Employees will be satisfied only when they see that their work makes a meaningful contribution to the business. And that requires a system that measures, develops, and celebrates their contributions (Hall, 2008; 5). The importance of HR function is increases. The importance of HR is recognized in many ways. Top executives' attitudes about the importance of the HR function have a significant impact on an organization's bottom line (Phillips, 1996; 6). The seven top priorities that HR executives should be addressing today are:

1. Helping their organization reinvent/redesign itself to compete more effectively.
2. Reinventing the HR function to be a more customer focused, cost justified organization.
3. Attracting and developing the next generation–21st century leaders and executives.
4. Contributing to the continuing cost containment/management effort.
5. Continuing to work on becoming a more effective business partner with their line customers.
6. Rejecting fads, quick fixes and other HR fads; sticking to the basics that work.
7. Addressing the diversity challenge (Ulrich, Losey and Lake, 1997, 121).

The future of HR must include the development and acceptance of a simple, yet powerful theory base, so that the myriad HR activities can become grounded in the business and integrated with one another. HR must have an equally simple, yet focusing theory base (Ulrich, Losey and Lake, 1997, 18-19). Every HR process should leverage talent to fulfill the organizational vision. Ulrich, Losey and Lake (1997) also need to ensure that the various HR initiatives are integrated.

Table 2.1: Principles for Building the Future.
Source: Ulrich, Losey and Lake, 1997, pp 167.

1. Human resource strategy must be anchored to the business strategy.
2. Human resource management is not about programs; it's about relationships.

3. The Human Resource Department must be known as an organization that anticipates change and understands what is necessary to implement it.
4. Human Resources should be an outspoken advocate of employee interests, yet it must understand that business decisions have to balance a range of factors that often conflict with one another.
5. The effectiveness of HR depends on its staying focused on issues rather than personalities.
6. Human resource executives must accept that constant learning and skill enhancement are essential to their being a contributor to the business.

The relationship of a company to its customers is obviously of central importance to the company's value. Consequently, learning organizations spend considerable time on acquiring new information (e.g. investigating new markets) but often preserve obsolete routines and procedures, which have a negative effect on decision-making rules that govern the behaviour of individuals and teams of the organization (Navarro and Moya, 2005; 161). The key HR initiatives include:

- development of preliminary organizational designs and identification of the top three levels of management,
- assessment of critical players and deployment of appropriate resources in the new company,
- retention of key people and separation of redundant staff,
- development of a total rewards strategy for the combined companies,
- communications strategy development and implementation (Bramson, 2000; 59).

Table 2.2: Eight Best Human Asset Management Practices.
Source: Ulrich, Losey and Lake, 1997, pp 221.

Values: A constant focus on adding value in everything rather than simply doing something. In addition, there is a conscious, ongoing and largely successful attempt to balance human and financial values.

Commitment: Dedication to a long-term core strategy: They seem to build an enduring institution while changing methods but avoiding the temptation to chase

management fads.

Culture: Proactive application of the corporate culture. Management is aware of how culture and systems can be linked together for consistency and efficiency.

Communication: An extraordinary concern for communicating with all stakeholders. Constant and extensive two-way communication using all media and sharing all types of vital information is the rule.

Partnering: New markets demand new forms of operation. They involve people within and outside the company in many decisions. This includes the design and implementation of new programs.

Collaboration: A high level of cooperation and involvement of all sections *within* functions. They study, redesign, launch, and follow-up new programs in a collective manner enhancing efficiency and cohesiveness.

Risk and Innovation: Innovation is recognized as a necessity. There is a willingness to risk shutting down present systems and structure and restarting in a totally different manner while learning from failure.

Competitive Passion: A constant search for improvement. They set up systems and processes to actively seek feedback and incorporate ideas from all sources.

All HR executives are faced with an important challenge: A need exists to ensure that the function is managed appropriately and that programs are subjected to a system of accountability. In short, there must be some way to measure the contribution of human resources so that viable existing programs are managed appropriately, new programs are only approved where there is potential return, and marginal or ineffective programs are revised or eliminated altogether (Phillips, 1996; xiv). For enterprises, performance appraisal helps them diagnose whether the adopted strategy and organizational structure will help them achieve their goals. And the construction of performance appraisal indicators is also the first step for enterprises to conduct practical evaluations. In the era of new economy, enterprises must go through the transition from traditional performance appraisal systems to strategic performance appraisal systems. By integrating performance appraisal systems with strategies as well as integrated and global perspectives, enterprises are able to find out their competitiveness and the

direction for improvement. The balanced scorecard is a strategic management tool in the era of knowledge economy. It not only links organizational strategies, structures, and prospects but also combines traditional and strategic performance appraisal indicators. Thus, enterprises can transform long-term strategies and innovative customer values into substantive activities inside and outside the organization (Kuo and Chen, 2008; 1930-1931). Managing internal organizational processes and external market competitiveness often requires a different communication strategy, specifically silence and non-disclosure, while adhering to statutory regulations (Sussman, 2008; 331). Management and administration of employee benefits are important factors of the organization's human resource department.

As organizations demand much more from their employees as a result from external pressures, the role of managers in the future will have to change. The implications for future managers include more stress, new career perspectives, new skills and at least four new key competencies. There are also implications for human resource management. The new flexible, process-orientated organizations will need new recruitment and training systems which encourage adaptable managers and managers themselves will have to live with a large flow of IT-processed data as well as organizational complexity and ambiguity (Hiltrop, 1998; 70). It is expected that the rules governing successful companies in the future will be fundamentally different from these governing successful organizations today. Organizations will become much more complex and ambiguous places to work. Increasingly, transactional contracts of employment will become the norm in industry and a 'self-reliance' orientation will pervade the employment relationship. Also the role of the manager will become more lateral, with much more focus on people, customers and processes (Hiltrop, 1998; 70). The field of benefits communication appears to have emerged, or at least to have undergone a significant change, beginning in the 1980s and coincidental with a trend by organizations to offer benefit choices to their employees or members rather than provide a standard, one-size-fits-all package. The trend has continued, made increasingly complex as employees must choose from among a variety of investment and retirement options; health and dental plans; life insurance plans; pre-tax, emergency saving schemes; etc. The challenge for business, nonprofit and government organizations is to help employees not only make wise choices, but to feel confident in those choices in

order to remain satisfied, motivated and productive employees (Freitag and Picherit-Duthler, 2004; 475). During the same period, the channels by which relevant information may be conveyed to employees have enjoyed enormous technological advances. The Internet, intranets, e-mail, CD-ROMs,DVDs, video, and other means not available before the 1980s are increasingly accessible and affordable. Additionally, desk-top publishing has made possible dramatic improvements in low-cost, well-designed printed materials. Many organizations are seizing upon these advances to escalate their efforts in the area of benefits communication (Freitag and Picherit-Duthler, 2004; 476). Complicating these trends is the confusion organizations are experiencing in assigning responsibility for benefits communication. Typically, this important function is carried out within Human Resources, though HR managers generally lack extensive professional communication training and may not be adequately prepared to take advantage of emerging media channels or to design products and craft messages suitable for segmented internal publics. Often, in fact, benefits communication materials are merely transferred unfiltered and unmediated from vendors providing those benefits. Meanwhile, employee benefit perquisites have become an increasingly important element of the total compensation package, and the process of explaining package options deserves increased attention (Freitag and Picherit-Duthler, 2004; 476). Firm incentive provisions and self-regulation behaviors affect the creative capabilities of firms. On the other hand creative capabilities affect the social climate for innovation and consequently, climate for innovation should affect new product innovation (Fitzgerald, Flood, O'Regan and Ramamoorthy, 2008; 36) which let the organization dynamic.

In the late 1970s and early 1980s, previously unchallenged American industries lost substantial market share in both US and world markets. To regain the competitive edge, companies began to adopt productivity improvement programs which had proven themselves particularly successful in Japan. One of these "improvement programs" was the total quality management (TQM) system. In last two decades, both the popular press and academic journals have published a plethora of accounts describing both successful and unsuccessful efforts at implementing TQM. Like Chanticleer's theory, theories of quality management have been under revision ever since (Kaynak, 2003; 405). TQM can be defined as a holistic management philosophy that strives for continuous improvement in all functions of an organization, and it can be achieved only if the total

quality concept is utilized from the acquisition of resources to customer service after the sale (Kaynak, 2003; 406). Total quality management (TQM) has been applied as a way of improving activities and performance in firms (Tarí, Molina and Castejón, 2007; 483). Total quality management (TQM) practices have been implemented by firms interested in enhancing their survival prospects by including quality and continuous improvement into their strategic priorities (Hoque, 2003; 553). The advent of TQM foreshadows great and positive change for corporations and for human resource professionals in particular. HR can and will play a key role in a significant change. The HR director may be a passive receiver of a TQM effort initiated by another key manager. The HR manager may become part of a quality improvement project team or may be a member of a quality steering committee. Increasingly, however, the HR manager may be tapped to spearhead the total quality effort and belong to the quality council, a group of senior managers who direct the quality initiative (Phillips, 1996; 14). Top management leadership and employee empowerment are considered two of the most important principles of total quality management (TQM) because of their assumed relationship with customer satisfaction (Ugboro and Obeng, 2000; 247). For effective TQM it should be realized that HR is essential in implementing.

The prevailing definition of organizational human capital adopts a competence perspective. Flamholtz and Lacey emphasized employee skills in their theory of human capital. Later researchers expanded this notion of human capital to include the knowledge, skills and capabilities of employees that create performance differentials for organizations. Parnes defined human capital as that which "… embraces the abilities and know-how of men and women that have been acquired at some cost and that can command a price in the labor market because they are useful in the productive process." Thus, seen from the competence perspective, the central tenet of human capital is the purported contributions of human capital to positive outcomes of organizations. They can also help in improving financial performance of organizations (Hsu, 2008; 1317). Job performance is related to Employee competencies.

The resource-based view of the firm portends how organizational human capital may help develop a competitive advantage of an organization. According to this view, intangible resources or capabilities that are valuable, rare and difficult to imitate are

sources of sustained competitive advantage of organizations. In particular, a competitive advantage based on a single resource or capability is easier to imitate than one derived from multiple resources or capabilities. Organizational human capital constitutes bundles of unique resources that are valuable, rare, and inimitable for an organization's competitive advantage (Hsu, 2008; 1317). Organizational human capital is valuable because human resources differ in their knowledge, skills, and capabilities, and they are amenable to value-creation activities guided and coordinated by organizational strategies and managerial practices. Organizational human capital is rare because it is difficult to find human resources that can always guarantee high performance levels for an organization. This is due to information asymmetry in the job market. More importantly, human resources with various types of knowledge, skills and capabilities are configured in a way that is heterogeneous across organizations. This makes organizational human capital not just rare but also inimitable. Finally, the process by which human resources create performance differentials requires complex patterns of coordination and input of other types of resources. Each depends on the unique context of a given organization. The causal ambiguity and social complexity inherent in the process have made organizational human capital non-substitutable and inimitable (Hsu, 2008; 1317-1318). The results are;

- Organizational human capital is positively associated with organizational performance.
- Organizational knowledge sharing practices are positively associated with organizational human capital.
- Organizations that pursue an organizational strategy characterized by product innovation are more likely to implement organizational knowledge sharing practices.
- Organizations with upper-level managers that see knowledge as sources of competitive advantage are more likely to implement organizational knowledge sharing practices.

Human capital is also a primary component of the intellectual capital construct (Bontis and Fitz-enz, 2002; 225). Intellectual capital is defined as encompassing (1) human

capital, (2) structural capita and (3) relational capital. Roos *et al*. and Saint-Onge identify 'human capital' as the skills, knowledge, talents and capabilities of all individuals associated with an organization. This component represents the people within the organization, the employees, their tacit knowledge, skills, experience and attitude. Human capital represents the most important component of the intellectual capital. It is hard to copy, and thus provides the organization with a competitive advantage (Navarro and Moya, 2005; 164). Research suggests that investments in human capital can impact firm performance and is also central to the creation of unique or scarce resources which impact upon firm performance. Human capital is embedded within a dynamic multi-loop nexus of social capital, learning and the management of knowledge, all of which contribute to intellectual capital. It is based on the idea that human capital is potentially an invaluable source of sustainable competitive advantage (Fitzgerald, Flood, O'Regan and Ramamoorthy, 2008; 39). The firms' investments in human capital should positively influence self-regulation behaviors (Fitzgerald, Flood, O'Regan and Ramamoorthy, 2008; 36). One of the primary types of intangibles is human capital. A contextual variable that may influence the relation between human capital and the use of performance measures is the firm's pay structure (Widener, 2006; 201) which can be Balance Score Card as an example.

Although general human capital has a positive association with the proportion of portfolio companies that went public [initial public offering (IPO)], specific human capital does not. Specific human capital is negatively associated with the proportion of portfolio companies that went bankrupt. Interestingly, some findings were contrary to expectations from a human capital perspective, specifically the relationship between general human capital and the proportion of portfolio companies that went bankrupt (Dimov and Shepherd, 2005; 1). One way to capture the decision-making processes of top management teams is to use the demographic characteristics of the team members as a proxy. Two key demographic characteristics, education and experience underlie the concept of human capital. However, studies to date have focused on the quantitative nature of human capital, i.e., the idea that more is better, and have accordingly used measures such as years or degree of education or experience. When it comes to understanding knowledge as a key resource of the firm, it is also important to consider the qualitative aspects of human capital. In contexts where firms possess large quantities

of human capital, differences in quantity may matter less than differences in quality. (Dimov and Shepherd, 2005; 3). The link between organizational human capital and performance can be understood in the context of the resource-based view of the firm.

The firm's workforce is mobile and not owned by the firm. Since human capital can leave the firm at will, firms will want to extract the knowledge that is embedded in their employees through employing team mechanisms and collaboration. Moreover, studies have demonstrated that knowledge is most effective when exchanged with others. Therefore, firms that rely on human capital usually require cooperative efforts, knowledge exchange, collaboration between workers, and a collegial sharing environment. This type of environment is difficult to manage since the link between efforts and outcomes is not completely transparent (e.g., tasks are not programmable or easily specified). Thus, labor-intensive firms are characterized by weak links between effort and outcome (Widener, 2006; 202). Substantial research has demonstrated the positive effects of human–capital-enhancing HRM. Ichniowski, Shaw, and Prennushi (1987) reported that the impact of "cooperative and innovative" HRM practices had a positive and significant impact on organizational productivity. Companies have been encouraged to adopt a variety of performance-enhancing or progressive human resource management practices to improve their global competitiveness. Human–capital-enhancing HRM practices that focus on skill acquisition and development could facilitate adaptability and responsiveness as well as improve motivation and morale of employees (Zhu, Chew and Spangler, 2005; 41-42). While many researchers have found positive relation between human–capital enhancing HRM and organizational outcomes, other studies have found that there not.

Human resource management plays a critical role in this communication process between the leader and the members of the organization. Without human resource management's staffing, training, and communication, the vision of the leader is not effectively transmitted. For the vision to become a reality, the leader has to rely on human resource management to help employees to become passionate and excited about it, and the leader has to provide employees with a blueprint on how to achieve the vision. Passion comes from commitment and involvement which come from job and organizational changes created by human resource management. That is, employees

must be empowered so that they can enact the leader's vision (Zhu, Chew and Spangler, 2005; 42). One important factor of innovative activity is human capital—an individual's knowledge, skills and abilities that can be improved with education—both formal education and lifelong learning. Human capital can be firm-, industry- or individual-specific. The last type can also be understood as the general level of human capital in a country or region. The general level of human capital is more connected with formal education, while lifelong learning contributes more often to the industry- or firm specific human capital. (Kaasa, 2008; 2). However assessing and utilizing the human capital at the firm level is so important for innovation processes, Kaasa's analysis focuses on the general level of human capital.

Further, employee profiles have changed. For example, women and minorities constitute a higher percentage of the workforce and increasingly occupy higher-level positions. Nevertheless, few organizations target benefit communication messages to match employee segments in demographic and/or psychographic variables (Freitag and Picherit-Duthler, 2004; 476). Conceptual scheme for integrating individual and organizational aspects of employee careers, there are three different kinds of movements available to individual employees: They can move upward or downward in the organizational hierarchy (vertical movement), they can move circumferentially at the same level in the organization, usually from one department to another (functional movement); or they can move towards or away from the centre of the organization; where influence, knowledge and organizational decision making are concentrated (radial movement) (Orpen, 1998; 85).

3. RESEARCH

Motivation of this study is to create an inventive guide for today's human capital professionals with TRIZ methodology. TRIZ is a problem solving, analysis and forecasting toolkit which is initiated in technology and engineering first but started to extend to business and management problems and tasks in the last few decades.

In order to identify HCM problems, 19 key concepts are chosen as contradiction parameters. Furthermore 40 inventive parameters are identified along with sub parameters. Descriptive metrics are given for some parameters and two dimensional 19X19 contradiction matrix is created. These contradictions are employee satisfaction, employee motivation, human capital, management leadership, knowledge sharing, employee commitment, value alignment, structural capital, process execution, knowledge integration, training, retention of key people, relational capital, knowledge generation, business performance, skills and competences, strategy execution, innovation capability, culture and values. Human Capital Management is a vague issue that can lead many kinds of conflicts. TRIZ is an inventive problem solving method to solve these kinds of conflicts. The format of this study is based closely on Mann and Domb (1999) study which is an example of TRIZ principles in Business Management area.

3.1 TRIZ METHODOLOGY

3.1.1 History of TRIZ

Genrikh Saulovich Altshuller (1926-1998) developed the "Teorija Reschenija Izobretatel'skich Zadac" that he then called TRIZ (Theory of Solving Inventive Problems in English) in 1950. TRIZ is a problem solving, analysis and forecasting toolkit derived from the study of the global patent literature. Its basis is the study of patterns of invention in the global patent literature. He reasoned that the way to improve the quality and pace of innovation was to study the patent literature where inventions are documented. (Hipple, 2005) This is how he outlined new possibilities to learn

inventive creativity and its practical application. In 1945 he observed that patent applications were ineffective and weak. He also quickly recognized that bad solutions to problems ignored the key properties of problems that arose in the relevant systems. (Orloff, 2003). During his study, Altshuller found that more than 90% of the engineering problems had been solved before: the same fundamental problems (or Contradictions) in one area had been addressed by many inventions in other technological areas and the same fundamental solutions had been used over and over again. Based on the analysis of 40,000 patents, which Altshuller abstracted to 40 Inventive Principles, he then constructed the Contradiction Table to resolve over 1200 Contradictions between pairs of 39 standard engineering parameters. (Tong & Cong & Lixiang, 2006). This contradiction matrix is and will be used in non-technologic areas for years to come.

3.1.2 The concept of contradiction,

TRIZ researchers have identified the fact that the world's strongest inventions have emerged from situations in which the inventor has successfully sought to avoid the conventional trade-offs that most designers take for granted. More importantly they have offered systematic tools through which problem solvers can tap into and use the strategies employed by such inventors. The most commonly applied tool in this regard is the Contradiction Matrix – a 39X39 matrix containing the three or four most likely strategies for solving design problems involving the 1482 most common contradiction types. Probably the most important philosophical aspect of the contradiction part of TRIZ is that, given there are ways of 'eliminating' contradictions', designers should actively look for them during the design process (Mann, 2001; 124). If a contradiction can not be resolved with a Matrix, Souchkov (2007) suggests to use more sophisticated techniques to deal with contradictions, such as ARIZ (stands for Algorithm for Solving Inventive Problems).

Orloff (2003) mentioned that many philosophers and researchers of methods of creativity have recognized that the contradiction represents the essence of the problem in his book. He pointed out that before Genrikh Altshuller, no one transformed this concept into a universal key to uncover and solve the problem in itself. Contradiction began to work as a fundamental model for the first time with TRIZ in 1956 in a way

that opened up the entire process for solutions. TRIZ first turned contradiction into a constructive model equipped with instruments for the transformation of this model to remove this contradiction. Inventing means - remove a contradiction. Contradiction is the model of a system conflict that puts incompatible requirements on functional properties of components that are in conflict.

3.1.3 Difference between traditional approach and TRIZ approach

Orloff show the difference of traditional thinking and TRIZ thinking with a table in his book and explained as "Usual thinking is controlled by consciousness. It protects us from illogical modes of action and influences us with a large mass of strictures. But, every invention overcomes normal images of what's possible and what's not."

Table 2.3: Difference between traditional thinking and TRIZ thinking
Source: Orloff, 2003

#	Traditional Thinking	TRIZ Thinking
1	Tends towards making things easy, simplification of the requirements placed on the task	Tends to intensify, more complex requirements placed on the task
2	Tends to avoid "improbable" paths	Strives to follow paths that increase the "improbability"
3	Imprecise visual image of the object tied to its prototype	Precise visual image of the object tied to its ideal final result
4	"flat" image of the object	Image of the object "in its entirety": the object's sub- and super-systems are considered as well as the object itself
5	Image of the object as a "single picture"	The object is understood in its historical movement: yesterday, today, and tomorrow (if the present line of development continues)
6	"Fixed" and hardly changeable image of the object	Image of the object is "flexible" and can be easily changed in time and space
7	Memory provides similar and therefore weak analogies	Memory provides other and therefore strong analogies where information is constantly updated with new principles and procedures
8	"Barrier of specialization" gets stronger with time	"Barrier of specialization" is destroyed with time
9	Controllability of thinking does not increase	Thinking gets more controllable. Inventors view the path of thought from the side, can easily control the process of thinking, and distance themselves from "intrusive" variations

TRIZ is different from the traditional trial and error approach which mainly relies on brainstorming and becomes unreliable with increased complexity of the inventive problem. Table 2.3 shows the difference between the traditional approach and the TRIZ approach to creativity. As Tong & Cong & Lixiang can see, the traditional approach jumps from my problem to "my solution" directly, which is restricted by the inventor's personal knowledge. Each researcher has his own specialty and favorite directions for investigation, known as psychological inertia, which influences researchers to move in the same direction as they have on successful project searches in the past.

3.1.4 Management-TRIZ

Companies have to face several kinds of management problems. In this context, management is defined as an activity of organizing and contains aspects such as planning, controlling, and organization, as well as personal aspects such as leadership. Problems arise from all these areas, and are mainly characterized as management problems. In this context the 'Theory of Inventive Problem Solving' becomes more popular, because many problems cannot be solved by known solving methods or techniques. Several experts feel confident about the application of TRIZ to management problems. The transfer of TRIZ to the field of management is referred to as 'Management-TRIZ' (Mueller, 2005; 43). The first basic idea was to apply TRIZ tools through direct analogy to non-technical problems. Even if analytic tools such as resources can be applied easier to any kind of problems than, for example, scientific effects and phenomena, it seems to require some modifications. For management problems, it is necessary to go even further. Within a management problem, the human being, with individual characteristics and its own personality, plays an important role. (Mueller, 2005; 43). And it is not that easy to deal with dynamic human characteristics.

If TRIZ is rather well known and used in technology and engineering, applications of TRIZ in business and management areas have been practically unknown. This should not be surprising: TRIZ was created by engineers for engineers. But recently, within last few years, several TRIZ experts started to extend application of TRIZ techniques to business and management problems and tasks. Results appeared to be more than encouraging: seemingly unsolvable business and management problems were solved very fast. Souchkoc indicated that, still today, the majority of TRIZ professionals work

in the area of technology rather than business, this is their comfort zone. In addition, many TRIZ experts working in the technology areas are vaguely familiar with specifics of business environments; therefore direct applications of "technological" TRIZ are not always successful. (Souchkov, 2007). It was time to TRIZ for Business and Management.

Souchkov mentioned that after identifying the contradictions the next step is to solve them. The most popular technique for a majority of problems is a collection of 40 Inventive Principles and so-called "Contradiction Matrix" which provides a systematic access to the most relevant subset of Inventive Principles depending on a type of a contradiction. He pointed out that although 40 Inventive Principles look similar for both Technology and Business applications, the matrices are different. (Souchkov, 2007). While the Matrix for Technology and Engineering was originally developed by Altshuller in the 1960s, a Contradiction Matrix for TRIZ in Business and Management was developed by Darrell Mann and introduced in Mann & Domb, (1999) "40 Inventive (Management) Principles with Examples" and Mann (2004) Hands-on Systematic Innovation for Business and Management, Lazarus Press, 2004.

The first basic idea was to apply TRIZ tools to engineering problems. In the last few years, Inventive Principles and the Contradiction Matrix of TRIZ started to be studied in several non-technical areas like business, finance etc. This study aims to analyze how the 40 Inventive Principles can be applied in human capital management. Domb and Mann's (1999) study of TRIZ in Business subjects has appeared to organize the research in Human Capital Management better.

First, following model (figure 3.1) is created for Human Capital TRIZ approach referring to Beaty *et al. (*2003). According to Beaty *et al.,* this approach yields an HR Scorecard that enables the development of HR dashboards that capture HR's contribution. Several firms are pursuing such measurements systems and have made substantial progress. Boeing, General Electric, South-Corp Ltd., United Distillers & Vintners and Verizon are developing on-line, real-time metric systems to monitor HR processes and deliverables.

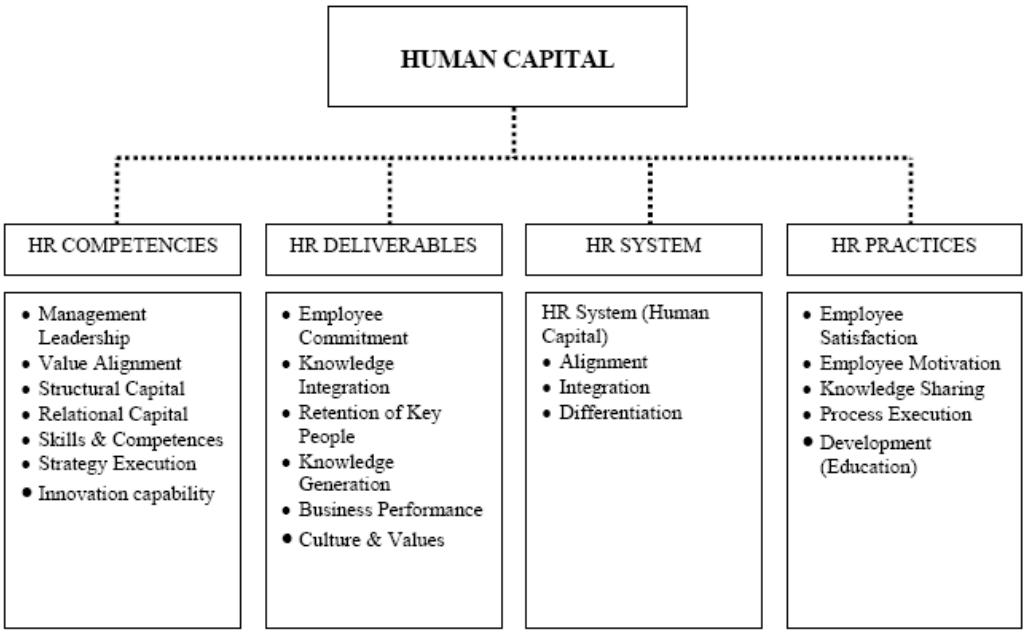

Figure 3.1: Human Capital Model for TRIZ evaluation

3.2 SELECTED HUMAN CAPITAL CONTRADICTION CRITERIA FOR TRIZ MATRIX

In this study, 19 contradiction criteria are selected to design two dimensional contradiction matrix. First fifteen criteria are from Bontis study for Human Capital. He selected these constraints based on a review of the intellectual capital, organizational learning and knowledge management literatures. The items from these constructs were based on established scales, as published by the Institute for Intellectual Capital Research. Each construct and item was reviewed by a team of representatives from the Saratoga Institute and Accenture for clarity, conciseness and face validity. (Bontis and Fitz-enz, 2002).The next four criteria are selected carefully from Human capital literature regarding important subjects that effect organization success.

These nineteen human capital dimensions are;

(1) Employee satisfaction; (2) employee motivation; (3) human capital (HR system); (4) management leadership; (5) knowledge sharing; (6) employee commitment; (7)

value alignment; (8) structural capital; (9) process execution; (10) knowledge integration; (11) training (development, education); (12) retention of key people; (13) relational capital; (14) knowledge generation; (15) business performance; (16) Culture and values; (17) Skills and competencies; (18) strategy execution; (19) innovation capability.

These nineteen human capital dimensions is given according to four groups in Figure 3.1.; Human Capital Competencies, Human Capital Deliverables, Human Capital System and Human Capital Practices.

3.2.1 Human Capital Competencies

3.2.1.1 Management Leadership

The dimension charismatic/value-based leadership reflects the ability to inspire, to motivate, and to successfully demand high performance outcomes from others, on the basis of firmly held core values. Team-oriented leadership emphasizes effective team-building in the sense of mutual support and the creation of a common purpose. Participative leadership reflects the degree to which managers involve others in making and implementing decisions. The fourth important leadership dimension is humane-oriented leadership, which describes supportive and considerate leadership behavior. Autonomous leadership refers to independent and individualistic leadership. Self-protective leadership describes leadership behavior that is self-centered, status conscious, procedural and conflict-inducing (Steyrer, Schiffinger and Lang, 2008; 365-366). Kaynak (2003) describes management leadership as;

- Management leadership is positively related to training.
- Management leadership is positively related to employee relations.
- Management leadership is positively related to supplier quality management.
- Management leadership is positively related to product design

He is also pointed out that Management leadership is an also important factor in TQM implementation because it improves performance by influencing other TQM practices. Successful implementation of TQM requires effective change in an organization's culture, and it is almost impossible to change an organization without a concentrated

effort by management aimed at continuous improvement, open communication, and cooperation throughout the value chain.

The dimensions of global leaders are described by Steyrer *et al*. (2008) as:

1. charismatic/value-based leadership,
2. team-oriented leadership,
3. participative leadership,
4. humane-oriented leadership,
5. autonomous leadership,
6. self-protective leadership

The field of organizational behavior has witnessed an increasing interest in studies of transformational leadership and human–capital-enhancing (or progressive) human resource management (Zhu, Chew and Spangler, 2005; 39-40). Leadership is one of the key driving forces for improving firm performance. Leaders, as the key decision-makers, determine the acquisition, development, and deployment of organizational resources, the conversion of these resources into valuable products and services, and the delivery of value to organizational stakeholders. (Zhu, Chew and Spangler, 2005; 40-41). As it seen from the recent studies Management leadership is another important issue in Human capital area.

3.2.1.2 Value Alignment

The relationship of a company to its customers is obviously of central importance to the company's value (Navarro and Moya, 2005; 161). Daryl (2006) pointed out that many leaders forget about the importance of values in an organization. He thinks that few institutions take responsibility for value alignment and they don't hire employees with values in mind. Organizations communicate their expectations through their corporate culture (Daryl, 2006). Not only leaders and managers but also workers should align their values. In their study, Deckop *et al*. (1999) indicated that the strength of the pay for performance link had a negative impact on OCB for employees low in value alignment with the organization, but not for employees high in value alignment. As Williams (2002) guess, because they could not be financially calculated, the values and standards by which organizations melded and moved were somewhat minimized. As

Williams indicated that in his study; whether organizational values have indeed been lost, diminished or minimized, the managerial practices of the 1980s and 1990s have not fostered an alignment of core values with business strategy.

3.2.1.3 Structural Capital

Structural capital is the value of everything that stays behind after the employees have left the organization. Structural capital encompasses codified knowledge, procedures, processes, goodwill, patents and culture. The 'structural capital' represents the 'tangible' intangibles. It is the part of intellectual capital systematized and internalized by the organizations. Increasingly, managers of organizations have become aware of the fact that translating human capital into a structural capital constitutes, in itself, an investment. If knowledge is safely stored in the organizational databases and structures an organization stands to lose less money if one of its experts leaves with all the knowledge and information he or she may have (Navarro and Moya, 2005; 164) so organizational databases are strongly important for organizations.

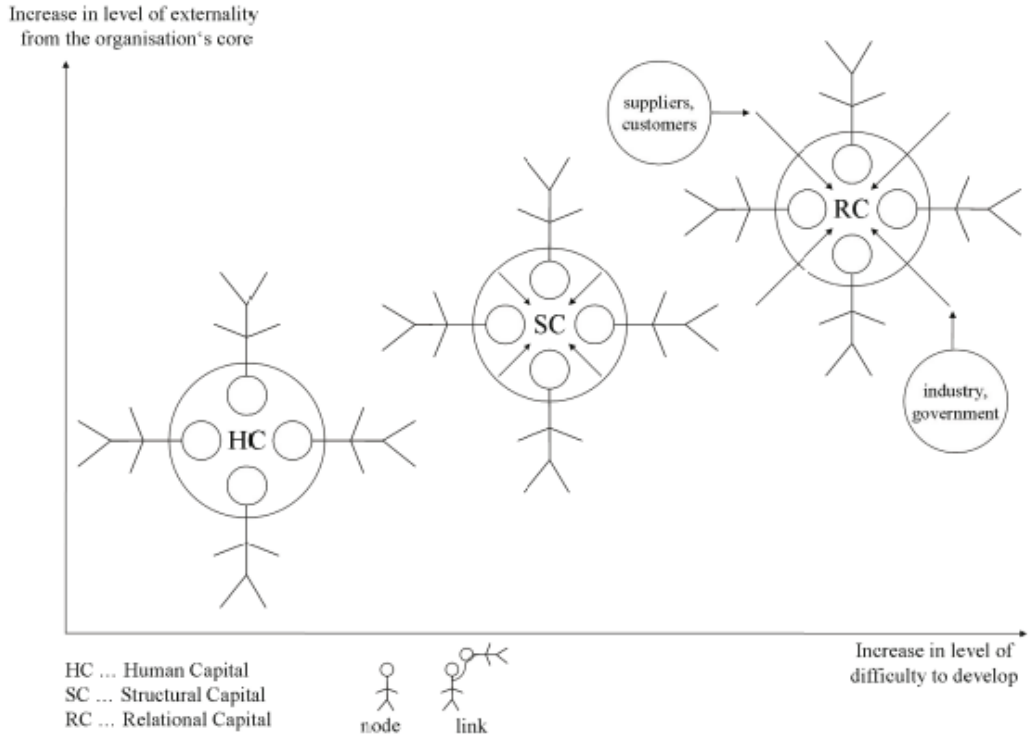

Figure 3.2: Transformation of Human Capital to Structural Capital
Source: Karagiannis, Waldner, Stoeger and Nemetz, 2008; pp 138.

For Karagiannies *et al*. Structural capital is *what is left after the employees have gone for the night* (Karagiannis, Waldner, Stoeger and Nemetz, 2008; 138). And similarly, Lank has defined Structural capital as what is left behind if every employee did walk out the door. Different organizations will define structural capital differently—some even use the term 'organizational capital' (Lank, 1997; 74). The high volatility of human capital and the fact that it is harder to extract value from human capital than from the more institutionalized and conceptualized structural capital (Karagiannis, Waldner, Stoeger and Nemetz, 2008; 135-136). This is the reason for why organizations strive to transfer employee's knowledge into organizational memory.

3.2.1.4 Relational Capital

'Relational capital' is defined by Brooking as the value of relationships that an organization maintains with the environment (Brooking, 1996). Roos and Roos (1997) extend the concept to include, in addition to relationships with clients to relationships with suppliers, relationships with partners and relationships with investors. Sveiby (1997) terms this component of intellectual capital the 'external structure', and it can be further extended to include relationships with commercial brands and the reputation or image of the company (Navarro and Moya, 2005; 164). Similarly, Relational capital—defined as quality relationships formed and maintained between people and entailing shared meaning, commitment, and norms of reciprocity within a particular work unit and between people of one unit with people in other units in an organization—has been shown to play a role in both explaining level of internationalization and effective knowledge management (Carmeli and Azeroual, 2009; 86-87). Relational capital determines the value brought into an organization by cooperating with external stakeholders, such as customers, suppliers, and others (Karagiannis, Waldner, Stoeger and Nemetz, 2008; 138). Relational capital enables members to use their interactions with others to: (1) more fully assess current knowledge and pinpoint new issues that need further attention; (2) exploit the cognitive arsenal that members muster in the network so better plans can be made; (3) find ways of more effectively consolidating new knowledge with past routines; and (4) better define the ways in which this new knowledge can lead to new endeavors for the uptake, implementation, and combination of the next generation of knowledge (Carmeli and Azeroual, 2009; 88-89). Lee *et al.*

(2007) pointed out that Relational capital helps companies balance the acquisition of new capabilities with the protection of proprietary assets. On the other hand, they indicated that relational capital can also minimize the likelihood that an alliance partner will engage in opportunistic behavior to unilaterally absorb or steal information or know-how that is core or proprietary to its partners.

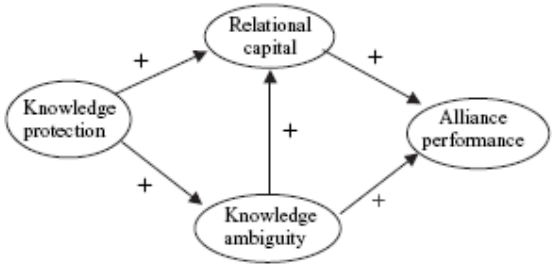

Figure 3.3: Relationships between Relational capital, Knowledge protection, Alliance performance and Knowledge ambiguity
Source: Lee, Chang, Liu and Yang, 2007; pp 59.

3.2.1.5 Skills and Competences

Employees must acquire new competences and qualifications throughout their lives, in order to be able to deal with the multiple changes in the labor market. Employees must necessarily acquire new competences and qualifications throughout their professional lives so as to successfully meet the needs of their job. The specific knowledge and competences, acquired either formally or non-formally, must be recognized so that they can be transferred and utilized (Siskos, Grigoroudis, Krassadaki and Matsatsinis, 2007; 867). From the resource-based view, especially in the era of the knowledge economy, firms employed downsizing strategies to reduce redundancy and selectively maintain the best labor. They still had to improve the quality of remaining employees and urge them to learn new skills which revitalized the organization and eventually promoted the firms' competitive advantages. This was because organization learning was the basis of firms' strategic process and future competitive advantages (Tsai, Yen, Huang and Hung, 2007; 157-158). Hiltrop (1998) declared that managers of the future will need to acquire skills and competencies in the following six areas:

- Visioning and planning skills,

- Information handling skills,
- Influencing and negotiating skills,
- Creativity and learning,
- Team working and leadership,
- Change management skills.

3.2.1.6 Strategy Execution

A core HCM principle is to work top-down: Everything starts from the strategy (Hall, 2008; 30). Performance appraisal is a measurement of the achievement of organizational goals and the goals of enterprise activities are to enhance business performance. As to the indicators of business performance, financial performances, such as return on investment, sales income, and profitability, were usually adopted by researchers as indicators of performance appraisal in early years. Performance appraisal indicators cannot be determined from a single perspective. The scope and perspectives involved are very complicated and extensive, and many expected goals are included. Performances of three areas are financial performance, operational performance, and organizational effectiveness. Kaplan and Norton (1992) proposed the balanced scorecard to integrate financial and non-financial indicators for the performance appraisal system, so that enterprise strategies could be substantively put into action to create competitive advantages. The object and measures of the balanced scorecard are derived from organizational prospects and strategies. It not only preserves the traditional indicators in the financial perspective to measure tangible assets but also incorporate indicators in the customer, internal process, learning and growth perspectives to measure intangible assets or intelligence capital. It is stressed that enterprise strategies should be evaluated from financial and non-financial perspectives, and data completeness and extensive evaluations are important. (Kuo and Chen, 2008; 1931-1932) Thus, it can be viewed as a comprehensive performance appraisal tool.

3.2.1.7 Innovation Capability

Innovation capability is defined by Kim (1997) as the ability to create new and useful knowledge based on previous knowledge. According to Burgelman *et. al.* (2004), innovation capability is “the comprehensive set of characteristics of an organization that facilitate and support innovation strategies”. Lawson and Samson extend the definition

considering that an innovation capability is a higher order "integration capability": they have the ability to mould and manage different key organizational capabilities and resources that successfully stimulate the innovation activities (Lawson and Samson, 2001). Research of Zhu *et al*. (2005) has shown that performing, high-involving, or progressive HRM is positively related to organizational outcomes, including innovation.

3.2.2 Human Capital Deliverables

3.2.2.1 Employee Commitment

Centrality refers to the extent to which individuals are more or less 'on the inside' in an organization. Individuals are regarded as central, as opposed to radical, in their organization when they have gained the trust and acceptance of the most influential and highly regarded (dominant) persons in the organization, are entrusted with the organization's most important and sensitive information, and are seen by others as embodying the values and culture of the organization and committed to its welfare. The boundaries of the radial dimension are determined by the extent of acceptance by the relevant dominant persons, while movement along the dimension is achieved largely through interpersonal skills, trust, and commitment to the organization (Orpen, 1998; 86). Organizational commitment was the employee's attitudes toward the organization; it was the sum of recognition and response to work. Researchers have proposed that organizational commitment would benefit firms. Morris and Sherman (1981) showed that organizational commitment could not only predict turnover behaviors, but also employees' performance.

Meyer, Bobocel, and Allen (1991) defined organizational commitment as;

(1) affective commitment, where employees psychologically and emotionally recognized and appreciated their relationship with the organization;

(2) normative commitment, where employees believed that being loyal and committed to the organization was a necessary virtue;

(3) continuance commitment, where employees remained in one firm due to the utilitarian benefits.

Until now, learning commitment has not been covered together with organizational commitment. In the knowledge management field, the factors related to the human and social aspect have not been given much consideration. Hence, very little literature concerning learning commitment was found. However, employees' learning commitment and willingness to learn new knowledge and skills has been a vital force in maintaining corporate competitive advantages in this knowledge economic era (Tsai, Yen, Huang and Hung, 2007; 161). According to Organizational Commitment (OC) theory, an employee's commitment (at least that of the affective type) does not merely make him or her remain with the organization irrespective of the circumstances, but also contributes to his or her efforts on its behalf (Steyrer, Schiffinger and Lang, 2008; 366). Relatively early research showed Organizational Commitment (OC) as having an impact on job performance, turnover, pro-social behavior, and turnover intentions or likelihood, as well as on absenteeism, altruism towards colleagues and job stress (Steyrer, Schiffinger and Lang, 2008; 366).

Mak and Sockel (1999) stated that poor retention can be due to employee turnover, burnout, and lack of commitment. Retention can manifest itself in three ways:

1. The employee may decide that his or her needs can no longer be met by the organization and develop an intention to leave the firm or change career path;

2. The employee may develop an enhanced sense of loyalty and commitment to the organization;

3. The employee may be so stressed that he or she may turn into `burn-out' mode, when the employee ceases to contribute effectively to the organization.

They pointed out that Turnover of employee should be well managed, because the people who leave may be among the best employees. In other cases, even if the employees do not leave the lack of morale due to burnout or low commitment may mirror the problems caused by employee turnover. Retaining a healthy team of committed and productive employees, therefore, is necessary to maintain a corporate strategic advantage.

3.2.2.2 Knowledge Integration

Knowledge integration (KI)—a dynamic capability through which family members specialized knowledge is recombined—guides the evolution of capabilities (Chirico and Salvato, 2008; 169). Knowledge usually resides within individuals. Individual specialized knowledge is the specific expertise possessed by an individual in a given domain to perform a specific task or activity in that specific domain. This implies that KI is a fundamental process through which firms gain the benefits of knowledge. Enberg defines KI as a collective process through which different pieces of specialized knowledge from different individuals are recombined "with the purpose of benefiting from knowledge complementarities existing between individuals with differentiated knowledge bases." (Chirico and Salvato, 2008; 172-173). Grant (1996) developed the theory of knowledge integration to synthesize earlier knowledge management research, as he noted, "the primary role of the firm, and the essence of organizational capability, is the integration of knowledge". Janczak (2002) analyzed the process model of knowledge integration within the organization into three stages: (1) awareness, (2) exploring versus exploiting knowledge, and (3) codifying and assessing results. Morosini (2004) argued that both the degree of knowledge integration between an industrial cluster's agents and the scope of their economic activities, are critical dimensions behind their economic performance. Ravasi and Verona (2001) argued that three structural properties of the new organization emerged as the cornerstones of the knowledge integration process: multi-polarity, fluidity and interconnectedness. They showed how these properties enhance the effectiveness, efficiency and flexibility of knowledge integration processes. They are in accord with Grant (1996) who argued that an organization's competitiveness derived from knowledge integration is determined by three factors: the efficiency, scope and flexibility of integration (Hung, Kao and Chu, 2008; 178). In the global market, inter-firm collaborative product development has become an increasingly significant business strategy for enhanced product competitiveness. Experimental practice is a crucial process for knowledge integration and technology innovation (Hung, Kao and Chu, 2008; 177). Engineering knowledge is a key asset for technology-based enterprises to successfully develop new products and processes.

3.2.2.3 Retention of Key People

One of the key HR initiatives is retention of key people in organizations (Bramson, 2000; 59). During the last decade, employee retention has become a serious and perplexing problem for all types of organization. From all indications, the issue will compound in the future, even as economic conditions change (Phillips, Connell, 2003). Employee retention will continue to be an important issue for HR.

The research evidence strongly suggests that dissatisfaction with payment arrangements in an organization is a bigger cause of employee turnover than the simple desire to earn more money. The amount of pay that is given to individual employees is seen by them as a powerful indicator of their individual worth to the organization. It can also be significant status symbol and acts as an important form of tit-for-tat compensation when burdens are shouldered by particular employees. For the majority of people these are far more salient issues and have greater capacity to affect their behavior than concerns about the purchasing power of their pay packets. Perceptions of unfairness or injustice in payment matters are thus the big turnover drivers when it comes to reward policy. Eliminating these, as far as it is possible to, must therefore be a priority for organizations wishing to improve their staff-retention records (Taylor, 2002). Managing retention and keeping the turnover rate below target and industry norms will be continue to be most challenging issues facing businesses.

3.2.2.4 Knowledge Generation

The understanding of how a firm can manage knowledge is an issue that has received increasing attention in both theory and practice over the past ten years: on the one hand, Ditillo have seen the emergence of the knowledge-based theory of the firm, on the basis of which, knowledge and the capability to create and utilize such knowledge are the most important sources of competitive advantage; on the other hand, there has been an attempt to define knowledge-intensive firms and explain their organizational and management features. In general terms, knowledge-intensive firms refer to those firms that provide intangible solutions to customer problems by using mainly the knowledge of their individuals. Typical examples of these companies are law and accounting firms, management, engineering and computer consultancy organizations, and research centers (Ditillo, 2004; 401). Senge (1990) defines the ‘learning organization’ as a group of people continually enhancing their capacity to create what they want to create. Ang and

Joseph (1996) contrast 'organizational learning' and 'learning organization' in terms of process versus structure. Sharkie (2003) recognizes that a learning organization should foster a structure to encourage individuals to share their tacit knowledge with others in order to create new knowledge. However, most organizations are focused on the 'learning process' and do not encourage 'unlearning structures' (Navarro and Moya, 2005; 161). Organizational learning is the process of developing organizational knowledge.

Knowledge-intensive firms have been defined in different ways by the various contributions as: firms that use, more than the average, employees in fields that require a sophisticated knowledge and whose expertise is the source of a competitive advantage; firms "in which … experts are at least one-third of the personnel" and experts are "those with formal education and experience equivalent to a doctoral degree". Thus, in general, according to these definitions, knowledge-intensive firms' capital consists predominantly of human capital, their critical elements are in the minds of individuals and heavy demands are made on the knowledge of those who work in them. Alternatively, such a type of firms also has been characterized as those that deploy their "assets in a distinctive way, for they sell a capacity to produce, rather than a product" and finally those that process what they know into unique knowledge products and services for their customers, or possibly goods in combination with services. They are less capital-intensive than companies in the manufacturing industries and more learning-intensive than those operating in other service industries (Ditillo, 2004; 404). In his study, Ditillo stated that Knowledge-intensive firms have become more prevalent and more important as the business services sector has grown equally over the last twenty years and the world has been moving toward the so-called "postindustrial" economy. Yet, research has only just started to scratch the surface in this area of business and most of the existing writings have suggested simplistically that managing these organizations is mainly based on both attracting and keeping the key professional workforce—the most significant 'resource' of knowledge-intensive companies—and developing organization-specific knowledge of an informal nature, inscribed in organizational culture and a certain style of working.

3.2.2.5 Business Performance

Both classical organizational theory and strategic management theory suggest several important situational and/or environmental determinants of corporate performance (Steyrer, Schiffinger and Lang, 2008; 367). The results of a study suggested that four of the seven critical internal strategic success factors examined had a significant impact on company financial performance. Those factors are sales, R&D and distribution, information technology, and human resources (Gursoy and Swanger, 2007; 213). Gursoy and Swanger describe the results as;

- IT as a strategic internal factor will have a positive influence on company financial performance.
- Human resources as a strategic internal factor will have a positive influence on company financial performance.
- Research and development and distribution as strategic internal factors will have a positive influence on company financial performance.
- Marketing as a strategic internal factor will have a positive influence on company financial performance.
- Sales as a strategic internal factor will have a positive influence on company financial performance.
- Accounting as a strategic internal factor will have a positive influence on company financial performance.
- Customer service as a strategic internal factor will have a positive influence on company financial performance.

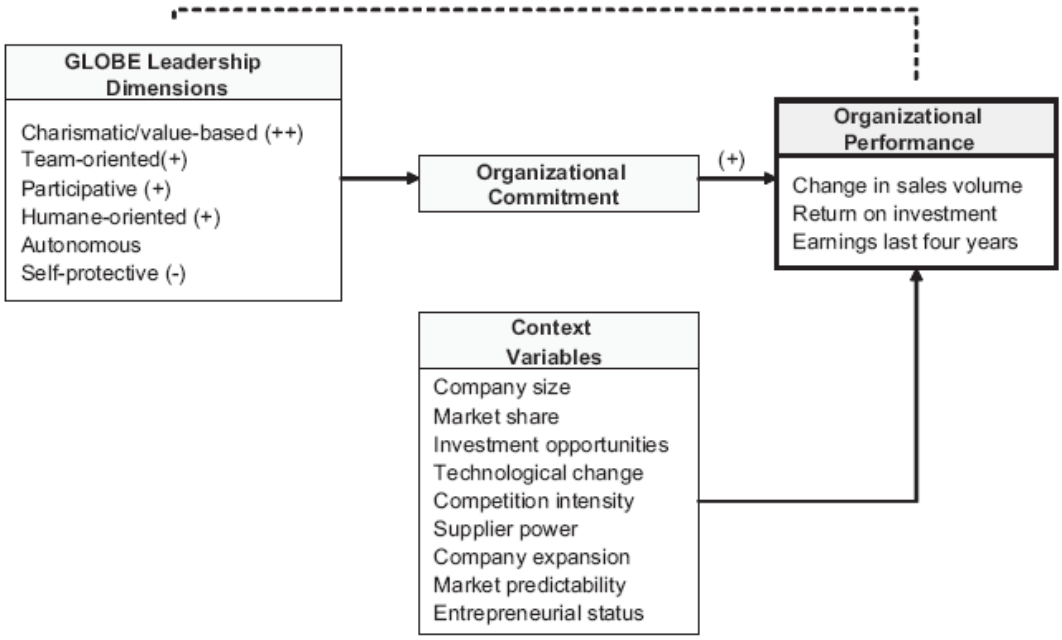

Figure 3.4: Relationships between GLOBE Leadership Dimensions, Organizational Commitment and Organizational Performance
Source: Steyrer, Schiffinger and Lang, 2008; pp 367.

Several factors affect the business performance; such as R&D capital, human capital, etc. (O'Mahony and Vecchi, 2008; 1)

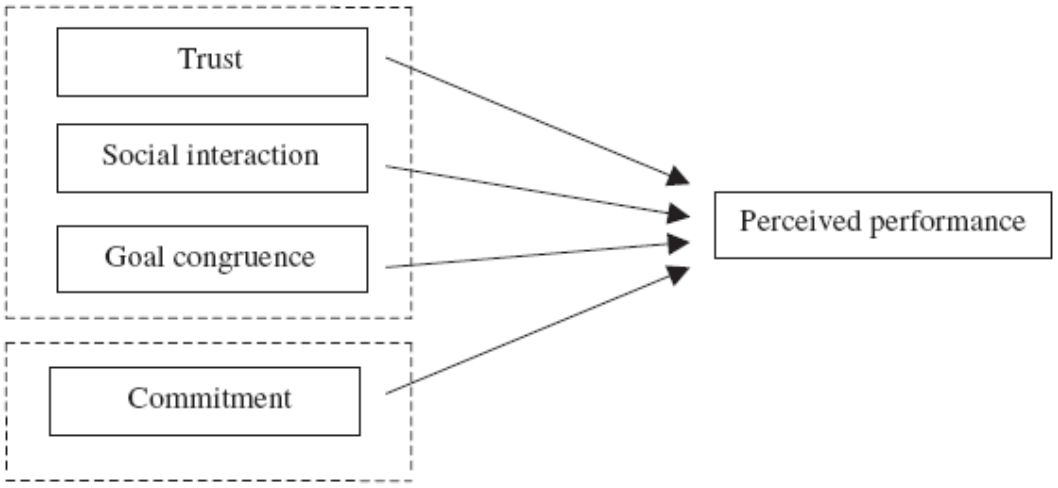

Figure 3.5: Perceived Performance
Source: De Clercq and Sapienza, 2006; pp 330.

3.2.2.6 Culture and Values

Culture is the sum of shared values. In day-to-day living, our values might include whether or when to get married, how many children to have, and expected educational achievements. At work, values might include innovation and personal growth. Values are composed of specific beliefs. For example, the value "personal growth" might comprise the following beliefs: "I believe that people should receive at least two weeks of formal training per year and the role of the managers is to help employees to learn. If you want to change culture, change values. If you want to change values, change beliefs and behaviors (Hall, 2008). There are a number of different characteristic of culture. Most scholars agree on at least four: learned, shared, transgenerational, and symbolic. Each merits consideration. Culture is learned. It is not inherited or biologically based. It is acquired through interaction and experience. Culture is shared. It is not unique or specific to single individuals. Everyone in the culture uses these common behaviors and activities. Culture is transgenerational. It is passes on from one generation to another. In this way, people know what is expected of them and how they should behave in specific situations. And culture consists of more than just words and behaviors. There are also nonverbal, implied meanings that are conveyed by the people walk, stand, and gesture. Incongruent values held by employee's damage group dynamics by creating unhealthy conflicts in an organization. These value conflicts can escalate over time. Organizations that have successfully leveraged workforce strategy as a key driver in the execution of their enterprise strategy will have successfully created a shared mind-set. There is clear understanding of what needs to be done to execute the firm's strategy, the role of the workforce strategy, and the role of measurement in this process. (Huselid, Becker, Beatty, 2005). Becker *et al*. pointed out that management researchers John Kotter and James Heskett found that firms with "stronger" cultures (as measured by the extent to which employees share the values of the firm) tend to achieve higher performance.

3.2.3 Human Capital System

3.2.3.1 Human Capital

Human capital theory identifies two types of human capital investments: (1) firm specific human capital; and (2) general human capital investments. Firm specific human capital (product knowledge, for example) consists of knowledge, skills and abilities that are unique and valuable to the focal firm but have no utility to other firms. General

human capital consists of skills that can be applied at the focal firm as well as other organizations. Therefore employees who master general human capital skills can command a wage premium in the market from other firms that are willing to pay for the employees' higher productivity while avoiding to pay for the costs of general training (Balkin and Richebé, 2007; 53-54). The human capital theory suggests that investments firms make in their human capital should provide employees with the knowledge and tools necessary to engage in self-regulatory behaviors. That is, in dynamic industries such as high-technology sectors, the environmental change may be rapid. To the extent firms invest in their employees to acquire the necessary knowledge of the changes in technologies and business processes occurring outside of their organization, they are more likely to rely on self-regulation than hierarchical dictates to act in the best interest of the firm. Such self-regulation may also provide them with the opportunity to share their knowledge within the organization with the other members and consequently generate novel ideas and engage in experimentation (Fitzgerald, Flood, O'Regan and Ramamoorthy, 2008; 37). Human capital theory posits that individuals with more or higher quality human capital achieve higher performance in executing relevant tasks such as the pre- and post-investment activities of the venture capital process (Dimov and Shepherd, 2005; 1-2). According to Lank (1997), Human capital is the knowledge, skills and experience of the people who work within or in partnership with the organization. People can walk out the door at any time and their value to the organization can easily be lost.

Human capital is the profit lever of the knowledge economy. An organization's members possess individual tacit knowledge (i.e. inarticulable skills necessary to perform their functions). In order to illustrate the degree to which tacit knowledge characterizes the human capital of an organization, it is useful to conceive the organization as a productive process that receives tangible and informational inputs from the environment, produces tangible and informational outputs that enter the environment, and is characterized internally by a series of flows among a network of nodes and ties or links (Bontis and Fitz-enz, 2002; 224-225). Human capital has also been defined on an individual level as the combination of these four factors: your genetic inheritance; your education; your experience; and your attitudes about life and business. Human capital is important, because it is a source of innovation and strategic

renewal, whether it is from brainstorming in a research lab, day-dreaming at the office, throwing out old files, re-engineering new processes, improving personal skills or developing new leads in a sales rep's little black book. The essence of human capital is the sheer intelligence of the organizational member (Bontis and Fitz-enz, 2002; 225). Also, Human capital is defined as capabilities, knowledge, and expertise that is literally located in the employees' heads (Karagiannis, Waldner, Stoeger and Nemetz, 2008; 138).

Human resources are the efforts, skills, and capabilities that people contribute to an employing organization that enable it to continue in existence. Human–capital-enhancing HRM is generally perceived as a distinctive approach to managing people that seeks to achieve competitive advantage through the strategic development of a highly committed and capable workforce. Sophisticated and integrated HRM practices will have a positive effect on employee performance by increasing knowledge, skills and abilities, improving motivation, reducing shirking and absenteeism, and increasing the retention of competent employees. Three factors underpin the human–capital-enhancing approach towards HRM. First, there is a distinctive philosophy which emphasizes employee commitment and motivation. Second, relations of trust allow scope and flexibility for employees to exercise influence. Third, culture and leadership styles become important focuses for action in their own right (Zhu, Chew and Spangler, 2005; 41). Dimov and Shepherd (2005) indicates that; a key component of human capital is the possession of knowledge that is specific and not easily appropriable, and which yields competitive advantage. Numerous studies have established that human capital is a key factor in explaining organizational performance.

3.2.4 Human Capital Practices

3.2.4.1 Employee Satisfaction

Employee satisfaction has become an important issue in the last two decades. In employee satisfaction literature there are many different definitions. While some of the definitions focus on the job itself, others include all the job-related factors. Some researchers have defined satisfaction as positive feelings or aggressive responses; whereas others defined it as the gap between expected gain and the actual gain. Hoppock initially proposed the concept of job satisfaction in 1935. He considered that

job satisfaction was composed of what was felt in the working environment and what satisfied the employees both physically and psychologically. Cribbin proposed a more general definition: job satisfaction was a totality of feelings regarding the working environment, which included the work itself, supervisors, working groups, organizations, even family life. Seal and Knight conceptualized satisfaction from a psychological viewpoint: job satisfaction meant the overall emotional or evaluation responses from the employees to the job itself. It was an affective response. According to Locke, job satisfaction is an emotional reaction that "results from the perception that one's job fulfills or allows the fulfillment of one's important job values, providing and to the degree that those values are congruent with one's needs". (Nebeker, Busso, Werenfels, Diallo, Czekajewski and Ferdman, 2001; 30). Tsai, Yen, Huang (2007) define job satisfaction as the difference of job satisfaction level between the expected and actual situations. The influencing factors included organizational environments, safety, compensation, promotion, life and self esteem.

Some more recent researches have shown that employee satisfaction can be linked to customer satisfaction. Others have shown a relationship between a company's financial success and its commitment to management practices that treat people as assets. Logically, high employee job satisfaction may positively influence some of these attributes (Nebeker, Busso, Werenfels, Diallo, Czekajewski and Ferdman, 2001; 30-31). Generally, however, research on job satisfaction and performance has yielded mixed results. While some studies, have found a link between employee satisfaction and performance, other studies have found little or no such relationship. For example, Paradise and Tornow found that the relationship among employee satisfaction, customer satisfaction, and business performance is moderated by the size of an organization (Nebeker, Busso, Werenfels, Diallo, Czekajewski and Ferdman, 2001; 31). The results of an investigation had revealed that there is positive correlation between job satisfaction, top management leadership, employee empowerment and customer satisfaction.

Studies suggest that employee satisfaction plays a primary role in helping companies achieve financial goals. The logic for this argument is if a company takes care of its employees, the employees will take care of the customers. It is true that customers tend

to have a better experience with organizations that have higher levels of employee satisfaction and engagement. Taking care of employees can be defined as providing better pay, ongoing training, and making employees feel secure. Satisfied employees are more likely to be motivated and harder working than dissatisfied ones. However, even though company employees who are willing to work together, who are able to work beyond expectations, and who put themselves into the manager's shoes tend to work more efficiently, provide better services and, therefore, create higher customer satisfaction, several studies report that examination of the direct relationship between employee satisfaction and financial results tend to yield insignificant results suggesting an insignificant direct relationship between employee satisfaction and financial performance. Tornow and Wiley reported a consistent negative relationship between employee satisfaction (with such items as pay and benefits) and financial results. However, most other studies suggest an insignificant direct relation between employee satisfaction and financial performance. Wiley was unable to find any significant direct relationship between overall employee satisfaction and financial performance. (Chi and Gursoy, 2009; 247). Even though many arguments about employee satisfaction exist, most of the researchers agree on the importance of the issue.

3.2.4.2 Employee Motivation

Motivation is an extremely important and complicated topic. It has been well studied, but strong disagreement persists. Closely related to the issue of employee retention is their motivation. It is important to ensure employees work towards the goals of the organization. The fulfillment of needs is central to motivating employees, with motivators that increase satisfaction needing to be part of the job. Motivators are often viewed from the vantage of being internal or external. Internal motivators are concerned with the intrinsic needs satisfying the individual. They address special needs of the individual, such as growth, social approval, security, etc. External motivators are concerned with environmental factors brought by the organization to the individual. They are often regarded as manipulative and include praise, communication, benefits, or money (Mak and Sockel, 1999; 266). In his study Kahya (2007) states that; there are substantial relationships between employee performance both job grade and environmental conditions. Poor workplace conditions (physical efforts, environmental conditions, and hazards) result in decreasing employee performance consisted of

following organization rules, quality, cooperating with coworkers to solve task problems, concentrating the tasks, creativity, and absenteeism.

Some researches show that there is a relation between employee motivation, service learning and perceived service quality. Most experts agree that a learning organization whose employees have a clear vision of the importance of service quality and are motivated to provide that quality will achieve superior service quality. Higher levels of employees' motivation and organizational learning positively affect perceived service quality (Hays and Hill, 2001; 335). Job satisfaction has traditionally been defined as a positive emotional state reflecting affective (fondness) attitude or response towards the job situation. It is an important motivator for employee performance; it is a causal antecedent to organizational commitment, and negatively related to turnover and absenteeism (Mak and Sockel, 1999; 267). Affective commitment is an important determinant of organizational performance. According to Nyhan (1999), "affective commitment implies a strong bond between an individual and the employing organization". It is based on acceptance of the organization's goals and values, as well as a desire to stay with the organization and to provide high quality of work for the organization (Nebeker, Busso, Werenfels, Diallo, Czekajewski and Ferdman, 2001; 31). According to Mak and Sockel (1999), other one motivating factor is the perception of management on career development. Past studies have addressed how job satisfaction and perception of management policies on career development are important motivators.

3.2.4.3 Knowledge Sharing

Organizational knowledge sharing, argued to be able to improve organizational performance and achieve competitive advantage, is often not induced successfully. Organizational knowledge sharing practices are argued to be able to encourage and facilitate knowledge sharing, and are hypothesized to have a positive relationship with organizational human capital (employee competencies), which is hypothesized to have a positive relationship with organizational performance. Two organizational antecedents (innovation strategy and top management knowledge values) are hypothesized to lead to the implementation of organizational knowledge sharing practices (Hsu, 2008; 1316). Knowledge sharing is a test of human nature and accessing knowledge from colleagues

and unknown others can be difficult. As a result, knowledge sharing within organizations very often is not successful and organizational performance is not improved. Managerial interventions are needed to encourage and facilitate systematic knowledge sharing. Despite the growing interest in organizational knowledge sharing, empirical research on performance implications of knowledge sharing practices has not been sufficient and is called for. More importantly, researchers caution that organizational knowledge management/sharing practices do not directly lead to an improvement of organizational performance. Rather, organizational performance is improved through an improvement of intermediate (or individual) outcomes, following the implementation of knowledge management/sharing practices. A major goal of this research is to better understand such a causal mechanism (Hsu, 2008; 1316-1317). An organization within which knowledge sharing takes place will develop its human capital, i.e., competencies of human resources, through knowledge transfer and exchange. As organizational human capital is developed, human resources can improve their job performance and ultimately, organizational performance with new and relevant knowledge (Hsu, 2008; 1317). Although, there is no universally accepted definition of exactly what knowledge is. Some authors define it, for example, as the information individuals possess in their minds. This definition is argued by saying that data (raw numbers and facts) exist within an organization. After processing these data they are converted into information and, once it is actively possessed by an individual, this information in turn becomes knowledge. There are also other approaches to defining knowledge that are less dependent on the information technologies. One of the most cited is the approach proposed by Nonaka, who defines knowledge as the justified belief that increases the capacity of an entity to take effective action. Following this line of reasoning, knowledge can be seen from five different perspectives: (1) as a state of mind, (2) as an object, (3) as a process, (4) as a condition for access to information, or (5) as a capability. In this context and based on our own empirical observations, Grangel, Chalmeta and Campos define knowledge as the awareness that enables us to possess the skill or the capacity required in a particular situation (1) to deal with and resolve complex issues in an efficient and creative manner, and (2) to take advantage of opportunities by making the most appropriate decisions; and, enterprise knowledge as the network of connections among data and information that gives the people involved

in an enterprise and insight into its workings and enables them to act and to make decisions that add value to the enterprise (Grangel, Chalmeta and Campos, 2007; 1232). The new key resource is inside the heads of people: knowledge. What organizations know and the way they use it, is essential for success. An important manner of supporting a design process is through information and knowledge sharing. Knowledge structures can be built to store, manage, classify and use information and knowledge, in order to facilitate the process design (Guerra-Zubiaga, Donato, Ramfrez and Contero, 2006; 86). Within an organization, knowledge is often shared among employees in the form of various job-related documents, organizational rules, working procedures, personal experience, and know-how. According to Lu *et al*. (2006); knowledge sharing is crucial because it helps organizations promote best practices and reduce redundant learning efforts or 'reinventing the wheel'.

3.2.4.4 Process Execution

Management and administration of employee benefits rightfully fall under the purview of the organization's human resource department. So, too, has responsibility for benefits communication, though HR managers may lack the training, time and experience needed to administer a formal communication effort (Freitag and Picherit-Duthler, 2004; 475). Business process management systems today collect a lot of data about process executions: They log significant events that occur during process execution, such as the start and completion times of activities, the input and output data of each activity, failure events or other exceptions, and the assignment of resources to each activity. The log data is typically stored in a relational database, which can be queried to produce basic reports such as the number of workflow instances executed in a given time period, the average execution time, resource utilization statistics, etc. (Dayal, Hsu, Ladin, 2001). Dynamic process execution must involve with human resources and need supporting from IT applications and services.

3.2.4.5 Development (Training)

The knowledge and skills of an organization's workforce have become increasingly important to its performance, competitiveness, and innovation. Workplace learning and continuous improvement are now considered essential for an organization to remain competitive. Thus, it is not surprising that employee training is a multi-billion dollar industry worldwide (Tharenou, Saks and Moore, 2007; 251). Training programs are

learning experiences designed to produce desired cognitive and/or behavior change among participants (DePasquale and Geller, 1999; 238). Today businesses give very importance to their training activities. Because of there are effects of training on organizational-level outcomes. There is relationship between training and human resources, performance, and financial outcomes. The relationship between training and firm performance may be mediated by employee attitudes and human capital. Furthermore, training appears to be more strongly related to organizational outcomes when it is matched with key contextual factors such as organization capital intensity and business strategy, in support of the contingency perspective (Tharenou, Saks and Moore, 2007; 251). Further, Tharenou *et al*. indicates that training is related independently to organizational outcomes in support of the universalistic perspective of strategic human resource management rather than a configurationally perspective.

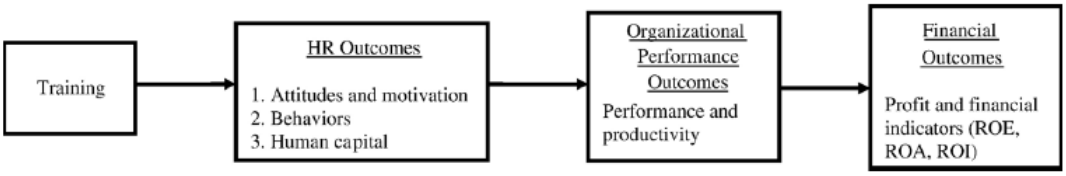

Figure 3.6 : Theoretical model linking training to organizational-level outcomes **Source:** Tharenou, Saks and Moore, 2007; pp 254.

Human capital theory, used by scholars to explain organizational training decisions, views training as an investment that should be justified according to its expected financial returns. Human capital theory suggests that training costs should be paid for when the firm is able to achieve acceptable financial returns to the training investment compared to alternative uses of how its financial resources could be employed. (Balkin and Richebé, 2007; 52-53). From the human capital perspective, the benefits of training for an organization consist of the incremental increase of employee productivity attributed to training less the costs of the training paid by the employer. The costs of training include direct costs (cost of providing the training) and indirect costs (cost of foregone productivity and salary expense when taking an employee away from the job in order to receive the training). The gains from training should accrue over a sufficient duration so that the total gains from training exceed the total costs of the training. Thus, in similar contexts, firms that expect to retain employees for long periods of time would

be expected to make heavier investments in human capital than firms that have low expectations of retaining employees (Balkin and Richebé, 2007; 53). From the resource-based perspective, organization learning is the foundation of firms creating their special resources and thereby increasing their competitive advantage. Organization learning is indeed derived from individual learning within the organization. However, many firms have adopted downsizing strategies to reduce the redundancy. Nevertheless, it had a great impact both on laidoff employees and remaining ones. The remaining employees lost their trust, loyalty toward the firm and eventually left. The consequence not only affected the firms' daily operation but also impacted employees' learning motivation for improving their ability to enhance the firm's competitive advantage (Tsai, Yen, Huang and Hung, 2007; 157). Evaluation is an important part of the teaching–learning process, and it becomes more difficult when individuals are developing a joint project and individual marks have to be assigned to the group members. Group work is a fact of life in the corporate workforce, and group work learning is considered crucial nowadays (Fernández-Breis, Castellanos-Nieves and Valencia-García, 2009; 339). According to Hocutt and Stone (1998); while empowered employees should have a feeling of autonomy to respond to service failures, they should also be trained to make appropriate decisions and to develop an awareness of customers' concerns.

3.3 40 INVENTIVE HR PRINCIPLES WITH EXAMPLES

Second part of the research consists of the adaptation of the 40 inventive principles of Genrich Altshuler's to Human Capital. In this study Mann and Domb's (1999) "40 Inventive Principles with Business examples" is used as an example. As seen with Domb and Mann's study, literature is searched and the most appropriate human capital issues are evaluated according to 40 principles. It should be reminded that this study contains subjectivity and should be regarded as a first step for the most appropriate solution.

1. Segmentation

- Cost analyses for reduction
- Training analyses
- Empowerment (Technical, leadership, team, project, Outdoor training)
- Work design (change working hours, Change administrative rules)

2. Extraction

- Advancement opportunities. (Compensation, Promotion, Job enrichment etc.)

3. Local Quality

- Work design (change working hours, Change administrative rules)
- Change physical work conditions
- Advancement opportunities (Compensation, Promotion, job enrichment etc)
- Performance appraisals
- Outsourcing
- Hire consultant

4. Asymmetry

- 360˚ Appraisals
- Strategic management
- Knowledge sharing (Advanced user friendly network information system, Open door policy)
- Improve communication channels

5. **Combining**

- Improve communication channels
- Equivalency between employers
- Social activities
- Cultural Integration

6. **Universality**

- Team building
- Team leadership
- Training analyses
- Managing diversity

7. **Nesting**

- Career maps
- Investment to employee
- Maslow's Hierarchy of Satisfaction

8. **Counterweight**

- Mergers (Cultural integration)
- Hire consultant
- Change recruitment system

9. **Prior counter-action**

- Work design (change working hours, Change administrative rules)
- Social activities
- Prior to a lay-off, prepare compensation, outplacement, and communication packages for all affected employees

10. **Prior action**

- Psychological counseling
- Mobbing training
- Improve communication channels
- Safety

11. Cushion in advance

- Recruitment

12. Equipotentiality

- Leadership training
- Career management

13. Inversion

- Rotation
- HR Rules (Recruitment system, Performance appraisal system)
- Apply BPR in HR

14. Spheroidality

- Work design (change working hours, Change administrative rules)
- Change organizational hierarchy
- Rotate leadership of a team

15. Dynamicity

- Empowerment (Technical, leadership, team, project, Outdoor training)
- Process management
- Flexible organization structure

16. Partial or overdone action

- Continuous improvement (Kaizen)
- Continuous training
- 360˚ Appraisals

17. Moving to a new dimension

- Authority by a manager to subordinate
- Changing organizational hierarchy

18. Mechanical vibration

- Cont. Audit System
- Cont. HC Metrics analyses

- Cont. HR scorecard

19. Periodic action

- Periodically Audit System
- Periodically appraisals
- Periodically HR metrics

20. Continuity of a useful action

- Lean HR

21. Rushing through

- Innovation culture
- Knowledge creation
- Suggestion system

22. Convert harm into benefit

- Free flow of information (encouraging to freedom of expression)
- Competition for new ideas

23. Feedback

- Knowledge sharing (Advanced user friendly network information system, Open door policy)

24. Mediator

- Hire consultant

25. Self-service

- Self evaluation system design
- Employee involvement

26. Copying

- Outsourcing
- Cost analyses for reduction
- 6 Sigma
- Employee satisfaction

- Employee commitment

27. Inexpensive, short-lived object for expensive, durable one

- Hire project-base employee
- Hire part time employee

28. Replacement of a mechanical system

- Differentiation in HR functions
- Differentiation in recruitment interview
- Differentiation in wage system (incentive payment etc)

29. Pneumatic or hydraulic construction

- Flexible organization structure
- Flexible management climate

30. Flexible membranes or thin film

- Change physical work conditions
- Delegate and leave people as free as possible

31. Use of porous material

- Flat organizations
- Knowledge theory (Remove communication barriers between Hierarchy)

32. Changing the color

- Change physical work conditions
- Social activities
- Increase social responsibility projects

33. Homogeneity

- Network organization
- T group training:

34. Rejecting and regenerating parts

- Hire consultant
- Project based working

35. Transformation of the physical and chemical states of an object

- Change performance criteria
- Change recruitment criteria
- Differentiation in wage system (incentive payment etc)
- Change promotion system

36. Phase transformation

- Restructuring of all kinds of relationships in the organization (between professional, manager, supervisor, co-worker, staff member or business owner, third parties)

37. Thermal expansion

- Restructuring HR rules regarding Employee satisfaction and Employee motivation

38. Use strong oxidizers

- Change the firm's strategic focus
- Recruitment of different cultures
- merging
- Strategic partnership

39. Inert environment

- Strengthen hierarchy
- Apply rules effective
- Strengthen controls
- Control absenteeism

40. Composite materials

- Multi-disciplinary project teams.
- Employ different personality types
- Decrease Hierarchy

3.4 DESCRIPTIVE METRICS

In order to evaluate the examples in the 40 principles study, literature is searched and descriptive metrics are defined for some of the examples in the following (Table 3.1). For the metrics referred by numbers under the Descriptive Metrics headline, please consult Appendix A.1.

Table 3.1: Descriptive metrics for some Human Capital principles

PRINCIPLE	EXAMPLES	DESCRIPTIVE METRICS
1. SEGMENTATION	Cost analyses for reduction	2, 6, 7, 11, 12, 13, 14, 15, 45, 47, 48, 69, 87, 135, 151, 154, 169, 176, 177, 178, 182, 183
	Empowerment (Technical, leadership, team, project, Outdoor training)	15, 24, 26, 28, 32, 33, 34, 35, 55, 56, 84, 100, 111, 164, 165, 166, 167, 181, 182, 183, 207, 214, 215, 225, 228, 232, 243, 244, 245, 252, 255, 265, 275
	Training analyses	15, 24, 26, 28, 33, 34, 35, 55, 56, 84, 164, 165, 166, 167, 181, 182, 183, 214, 215, 228, 243, 245, 255
	Work design (change working hours, Change administrative rules)	1, 22, 31
2. TAKING AWAY	Advancement opportunities (Compansation, promotion, job enrichment etc)	42, 48, 49, 60, 103, 112, 124, 126, 154, 155, 156, 157, 158, 175, 176, 177, 178, 179, 180, 187, 189, 192, 200, 202, 203, 204, 208, 221, 222, 236, 248, 254, 263, 268, 278, 276, 277
3. LOCAL QUALITY	Work design (change working hours, Change administrative rules)	1, 22, 31
	Outsourcing	64, 229, 230, 256
	Performance appraisals	36, 57, 88, 98, 104, 136, 140, 156, 160, 161, 162, 199, 211, 223, 224, 237, 238, 242, 249, 251, 267
	Advancement opportunities (Compansation, Promotion, job enrichment etc)	42, 48, 49, 60, 103, 112, 124, 126, 154, 155, 156, 157, 158, 175, 176, 177, 178, 179, 180, 187, 189, 192, 200, 202, 203, 204, 208, 221, 222, 236, 248, 254, 263, 268, 278, 276, 277
4. ASSYMETRY	360˚ Appraisals	59, 227, 285
	Improve communication channels	37, 91, 138, 228
	Knowledge sharing (Advanced userfriendly network information system, Open door policy)	37, 80, 266
	Strategic management	67, 68, 107, 110, 111, 119, 121
5. COMBINING	Cultural Integration	89, 90, 95, 99, 225
	Social activities	128

	Equivalency between employers	2, 124, 130, 187
	Improve communication channels	37, 91, 138, 228
6. UNIVERSALITY	Managing diversity	213
	Team building	63, 105, 150, 163, 210, 253
	Team leadership	70, 78, 113, 115, 288
	Training analyses	15, 24, 26, 28, 33, 34, 35, 55, 56, 84, 164, 165, 166, 167, 181, 182, 183, 214, 215, 228, 243, 245, 255
7. NESTING	Career management (Maps)	32, 224, 252, 265
	Investment to employee	32, 43, 44, 85, 101, 235
8. COUNTERWEIGHT	Change recruitment system	23, 25, 54, 64, 83, 139, 140, 141, 142, 143, 144, 153, 220, 256, 264, 289
	Mergings (Cultural integration)	89, 90, 95, 99, 225
9. PRIOR COUNTERACTION	Social activities	128
	Work design (change working hours, Change administrative rules)	1, 22, 31
10. PRIOR ACTION	Improve communication channels	37, 91, 138, 228
	Psycological counselling	27
	Safety	2, 3, 20, 12, 13, 19, 21, 26, 71
12. EQUIPOTENTIALITY	Career Management (Maps)	32, 224, 252, 265
13. OTHERWAY ROUND	Rotation	165
14. SPHERIDALITY	Work design (change working hours, Change administrative rules)	1, 22, 31
15. DYNAMICITY	Empowerment (Technical, leadership, team, project, Outdoor training)	15, 24, 26, 28, 32, 33, 34, 35, 55, 56, 84, 100, 111, 164, 165, 166, 167, 181, 182, 183, 207, 214, 215, 225, 228, 232, 243, 244, 245, 252, 255, 265, 275
	Flexible organization structure	125
16. PARTIAL OR EXCESSIVE ACTION	360˚ Appraisals	59, 227, 285
18. MECHANICAL VIBRATIONS	Cont. audit System	30
21. SKIP	Knowledge creation	78, 79, 81, 82, 106, 108, 112, 166
	Suggestion system	122, 123, 188, 190, 217, 218, 246, 274
22. TURN THE HARM TO ONE'S GOOD	Free flow of information (encouraging to freedom of expression)	31, 37, 86, 97, 108, 117, 120, 193, 240
23. FEEDBACK	Knowledge sharing (Advanced userfriendly network information system, Open door policy)	37, 80, 266
25. SELF-SERVICE	Employee involvement	72, 102
26. USE OF COPIES	Cost analyses for reduction	2, 6, 7, 11, 12, 13, 14, 15, 45, 47, 48, 69, 87, 135, 151, 154, 169, 176, 177, 178, 182, 183
	Employee satisfaction	13, 27, 46, 66, 92, 93, 103, 137, 141, 150, 152, 153, 155, 159, 163, 168, 196, 205, 231, 258, 290
	Employee commitment	127, 170, 231, 235
	Outsourcing	64, 229, 230, 256
27. CHEAP SHORT-LINES INSTEAD OF COSTLY LONG-LIFE	Hire project-base employee	63, 165, 212, 253

28. MECHANICAL PRINCIPLES REPLACEMENTS	Differentiation in HR functions	11, 16, 17, 18, 22, 31, 40, 41, 43, 44, 54, 64, 65, 67, 73, 74, 75, 76, 91, 109, 113, 114, 115, 116, 118, 132, 145, 146, 147, 149, 150, 151, 152, 153, 158, 163, 167, 171, 191, 192, 194, 197, 198, 241, 247, 256, 257, 280, 281, 282, 283, 284, 285, 286, 287, 288, 290, 291, 292, 293, 294
	Differentiation in wage system (incentive payment etc)	39, 58, 61, 62, 94, 201,219, 238, 239, 259, 260, 261, 267
29. PNEUMATIC AND HYDRAULIC STRUCTURES	Flexible organization structure	125
32. CHANGING COLOR	Social activities	128

3.5 19 X 19 TRIZ MATRIX FOR HCM

In order to build 19X19 matrix, 19 key concepts are chosen as contradiction parameters which are employee satisfaction, employee motivation, human capital, management leadership, knowledge sharing, employee commitment, value alignment, structural capital, process execution, knowledge integration, training, retention of key people, relational capital, knowledge generation, business performance, skills and competences, strategy execution, innovation capability, culture and values. Furthermore 40 inventive parameters are identified along with examples which is based on Mann and Domb study and descriptive metrics are given for some parameter examples in order to obtain measurability.

In this section, two dimensional 19X19 matrix, which forms the fundemental part of this research, is presented. Contents of the table are created by examining the articles in the literature. It should be reminded that Human Capital is a vague and complex structure and obtaining exact results can be quite difficult in the first effort. For this reason, this matrix should be regarded as an initial matrix instead of final matrix.

According to 40 Human Capital Principles 19X19 matrix for each contradiction pairs are created. Intersections of same contradictions are showed as "+" which states that it is not valid. Appropriate principles have been given for each combination of contradiction parameters pairs. Contradiction parameters listed on the left side of the table from top to bottom are improving features. The parameters lined up from top left to top right are worsening features.The numbers inside the boxes refer to 40 inventive principles mentioned earlier. If a feature, which has been tried to improve, worsens another feature, the numbers in the intersection point of these two features can be used to determine the principles for the solution. Boxes of the pairs, which have no interaction with the literature, are left void.

Table 3.2: 19X19 TRIZ matrix for Human Capital

improving / worsening	Employee Satisfaction	Employee Motivation	HR System (Human Capital)	Management Leadership	Knowledge Sharing	Employee Commitment	Value Alignment	Structural Capital	Process Execution	Knowledge Integration	Development (Education)	Retention of Key People	Relational Capital	Knowledge Generation	Business Performance	Skills & Competences	Strategy Execution	Innovation capability	Culture & Values
Employee Satisfaction	+		1, 15, 37			1, 10,		28	1, 32,				1				3	21	
Employee Motivation		+	1, 15, 20	12	4, 24	4	10	20, 28	1, 32,					25			3		
HR System (Human Capital)	10, 26	10, 14	+	12	22	14	11, 33	4, 12, 14, 28		17, 40,		28	29, 31,	1, 25, 30	1, 8, 9		3, 18	13, 15, 21	10, 14, 16, 24
Management Leadership	12	14	12	+	10, 22,	1	12	12, 26	1, 12	25	7	2, 28	1		1, 8, 12		3	3, 30,	6
Knowledge Sharing	4	4, 5		4, 6	+	4	4		4, 15		7	1, 4, 28		4	1, 4	4		4	4
Employee Commitment	3, 7	7	20	17		+			1, 39			2		1					
Value Alignment	4	5		5		7, 8	+		1						1, 5				
Structural Capital	14, 28, 35		1, 18	6, 15, 17	22, 29, 31,	1, 7, 18	7, 22, 29, 33	+	17	17, 31, 40	7, 26, 33	1	25, 27	1, 22, 30, 40	1, 8	19, 22	17, 21, 38	1, 21, 30,	7, 13, 16
Process Execution	3, 16, 28, 35	5, 10, 16, 20	1, 3, 18	12, 18, 40	29, 31, 40	4, 18, 24	16, 20, 29, 33	28	+	17, 20, 31	33	1, 2, 28	3, 29, 36	22, 30, 40	1, 29	22, 25	20, 21, 38	15, 21, 30,	6, 29, 32
Knowledge Integration	7	7								+		2			1				
Development (Education)	3, 26		3	3		3	3	3		3, 23	+			3	1		1, 3	1, 3	1
Retention of Key People	3, 4, 7, 28	7, 24	1, 2	6, 15, 17	10, 29	1, 2, 4	3, 9	4	1, 15	17	7	+	1, 27	2	1	25			7, 10,
Relational Capital	3				10	2	8	4	1	23, 25		1, 28	+		1, 16	8	1		6
Knowledge Generation	3, 14		1	6		1, 6, 18	11, 22			21				+	1		1	1	
Business Performance	3, 10, 14, 28	5, 10, 13,	1, 8, 13, 18, 28, 37	3, 6, 12, 18, 33	22, 28	24	33	4, 12, 19	3	21, 22	7, 26	2, 9, 28	3, 31, 32,	1, 22	+	19, 22, 33	18, 21, 38	15, 21, 30	1, 10, 16, 29
Skills & Competences					22		11		1, 11	17	7		1, 31	22, 30,	1, 8	+			11
Strategy Execution	3, 26	5	2, 3	6, 12, 17				4, 12	1, 15, 17, 34	17	7	1, 2		25, 30,	1, 16, 32		+	1	10
Innovation capability	3					8	8		1	21, 23	7		3, 29		1, 8, 29		1	+	11, 13
Culture & Values	6, 28	6		12		8	6, 8, 29	6, 26		6	7	28	29	22	1, 8	6		6	+

4. CONCLUSION AND FURTHER RESEARCH

World of knowledge has led Human resource management shift from "personnel management" towards a part of strategic management. In recent years, HRM was employing people, developing their resources, utilizing, maintaining and compensating their services in tune with the job and organizational requirement, but in today's world these are only basic responsibilities of Human Resource Managers. This change makes managing Human Resource a challenging problem. Also it is known that Human Resource Management and Human Capital management is a fuzzy and complex issue to deal with but also have important results on organization overall success. There are thousands of Human Resources and Human Capital management texts published every year which is a huge number that can not be followed up by managers. TRIZ is an inventive tool to design a guide for managers. The major contribution of this thesis is to show that Human Capital Management is an appropriate area to use TRIZ methodology.

In the beginning, TRIZ has applied to engineering problems. However in the last few years, Inventive Principles and the Contradiction Matrix of TRIZ started to be studied in several non-technical areas like business, finance etc. While the Matrix for Technology and Engineering was originally developed by Altshuller in the 1960s, TRIZ methodology was used in several subjects. This study is inspiring because Human Resource and Human capital has not been inspected before.

In this study 19 key concepts are chosen as contradiction parameters in order to identify HCM problems. First fifteen criteria are from; Intellectual capital ROI: a causal map of human capital antecedents and consequents (Bontis and Fitz-enz, 2002) which are employee satisfaction, employee motivation, human capital, management leadership, knowledge sharing, employee commitment, value alignment, structural capital, process execution, knowledge integration, training, retention of key people, relational capital, knowledge generation. Business performance, skills and competences, strategy

execution, innovation capability, culture and values are selected from Human Capital management literature. Furthermore 40 inventive parameters are generated along with examples which are based closely on Mann and Domb study which is an example of TRIZ principles in Business Management area. Descriptive metrics are given for some parameter examples to obtain measurabilty and finally 19X19 matrix is created to complete implementation.

Despite of this encouraging breakthrough, this research still have unavoidable limitations and several important issues that warrant further research. Subjectivity is the most important problem in this research. This model should be improved with other researcher's point of view to decrease the subjectivity. For an organization to be successful in the long term, its management style needs to be designed depending on its culture. To take into consideration of this fact, HR TRIZ matrix can be designed depending on firm's culture.

Regarding future research directions, it is recommended that researchers, who are interested, should focus on analyzing this study with three kinds of culture. Every company has its own "personality" or culture. For an organization to be successful over the long term, its management style needs to be designed depending on its culture. To take this fact into consideration , HR TRIZ matrix can be designed depending on firm's culture. It would be more convinient if three different matrixes are designed for each culture (focus); operational excellence, product(service) leadership, customer intimacy which has been introduced in Beatty *et al*. (2003); New HR Metrics:Scoring on the Business Scorecard.

It is expected that the results of this study can supply another useful reference and message for managers' pragmatic application. Nevertheless, this research may provide a useful reference for researches who are interested to improve this methodology.

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APPENDICES

APPENDIX A.1 List of Descriptive metrics

No	Subject	Metric	Source
1	Efficiency measures	Absenteeism rate by job category and job performance	Becker *et al*. (2001)
2	Efficiency measures	Accident costs	Becker *et al*. (2001)
3	Efficiency measures	Accident safety ratings	Becker *et al*. (2001)
4	Efficiency measures	Average employee tenure (by performance level)	Becker *et al*. (2001)
5	Efficiency measures	Average time for dispute resolution	Becker *et al*. (2001)
6	Efficiency measures	Benefits costs as percentage of payroll or revenue	Becker *et al*. (2001)
7	Efficiency measures	Benefits costs/competitors' benefits costs ratio	Becker *et al*. (2001)
8	Efficiency measures	Compliance with federal and state fair employment practices	Becker *et al*. (2001)
9	Efficiency measures	Compliance with technical requirements of affirmative action	Becker *et al*. (2001)
10	Efficiency measures	Comprehensiveness of safety monitoring	Becker *et al*. (2001)
11	Efficiency measures	Cost of HR-related litigation	Becker *et al*. (2001)
12	Efficiency measures	Cost of injuries	Becker *et al*. (2001)
13	Efficiency measures	Cost per grievance	Becker *et al*. (2001)
14	Efficiency measures	Cost per hire	Becker *et al*. (2001)
15	Efficiency measures	Cost per trainee hour	Becker *et al*. (2001)
16	Efficiency measures	HR department budget as a percentage of sales	Becker *et al*. (2001)
17	Efficiency measures	HR expense per employee	Becker *et al*. (2001)
18	Efficiency measures	HR expense/total expense	Becker *et al*. (2001)
19	Efficiency measures	Incident of injuries	Becker *et al*. (2001)
20	Efficiency measures	Interviews-per-offer ratio (selection ratio)	Becker *et al*. (2001)
21	Efficiency measures	Lost time due to accidents	Becker *et al*. (2001)

22	Efficiency measures	Measures of cycle time for key HR processes	Becker *et al*. (2001)
23	Efficiency measures	Number of applicants per recruiting source (by quality)	Becker *et al*. (2001)
24	Efficiency measures	Number of courses tought by subject	Becker *et al*. (2001)
25	Efficiency measures	Number of recruiting advertising programs in place	Becker *et al*. (2001)
26	Efficiency measures	Number of safety training And awareness activities	Becker *et al*. (2001)
27	Efficiency measures	Number of stress-related illnesses	Becker *et al*. (2001)
28	Efficiency measures	Number of training days and programs per year	Becker *et al*. (2001)
29	Efficiency measures	Offer to acceptance ratio	Becker *et al*. (2001)
30	Efficiency measures	OSHA audits	Becker *et al*. (2001)
31	Efficiency measures	Percentage of correct data in HR information system	Becker *et al*. (2001)
32	Efficiency measures	Percentage of employee development plans completed	Becker *et al*. (2001)
33	Efficiency measures	Percentage of employees with access to appropriate training and development opportunities	Becker *et al*. (2001)
34	Efficiency measures	Percentage of new meterials in training programs each year	Becker *et al*. (2001)
35	Efficiency measures	Percentage of payroll spenton training	Becker *et al*. (2001)
36	Efficiency measures	Percentage of performance appraisals completed on time	Becker *et al*. (2001)
37	Efficiency measures	Response time per information request	Becker *et al*. (2001)
38	Efficiency measures	Sick days per full time equivalent per year	Becker *et al*. (2001)
39	Efficiency measures	Speed of salary action processing	Becker *et al*. (2001)
40	Efficiency measures	Time needed to orient new employee	Becker *et al*. (2001)
41	Efficiency measures	Time to fill an open position	Becker *et al*. (2001)
42	Efficiency measures	Total compensation expense per employee	Becker *et al*. (2001)
43	Efficiency measures	Total HR investment/earnings	Becker *et al*. (2001)
44	Efficiency measures	Total HR investment/revenues	Becker *et al*. (2001)
45	Efficiency measures	Turnover Costs	Becker *et al*. (2001)

46	Efficiency measures	Turnover rate by job category and job performance	Becker *et al*. (2001)
47	Efficiency measures	Variable labor costs as percentage of variable revenue	Becker *et al*. (2001)
48	Efficiency measures	Workers' compensation costs	Becker *et al*. (2001)
49	Efficiency measures	Workers' compensation experience rating	Becker *et al*. (2001)
50	Efficiency measures	Number of qualified applicants per position	Becker *et al*. (2001)
51	HR Practices	Number of qualified applicants per position	Becker *et al*. (2001)
52	HR Practices	% of hired based on a validated selection test	Becker *et al*. (2001)
53	HR Practices	% of jobs filled from within	Becker *et al*. (2001)
54	HR Practices	% in a formal HR plan including recruitment, development and succession	Becker *et al*. (2001)
55	HR Practices	Number of hours of training for new employees (less than 1 year)	Becker *et al*. (2001)
56	HR Practices	Number of hours of training for experienced employees	Becker *et al*. (2001)
57	HR Practices	% of employees receiving a regular performance appraisal	Becker *et al*. (2001)
58	HR Practices	% of workforce whose merit increase or incentive pay is tied to performance	Becker *et al*. (2001)
59	HR Practices	% of workforce who received performance feedback from multiple sources (360)	Becker *et al*. (2001)
60	HR Practices	Target percentile for total compensation	Becker *et al*. (2001)
61	HR Practices	% of the workforce eligible for incentive pay	Becker *et al*. (2001)
62	HR Practices	% of difference in incentive pay between low-performing and high-performing employee	Becker *et al*. (2001)
63	HR Practices	% of the workforce routinely working in a self-managed, cross-functional or project team	Becker *et al*. (2001)
64	HR Practices	Percentage of HR budget spent om outsourced activities (e.g. recruiting, benefits, payroll)	Becker *et al*. (2001)
65	HR Practices	Number of employees per HR professional	Becker *et al*. (2001)
66	HR Practices	Percentage of the eligible workforce covered by a union contract	Becker *et al*. (2001)
67	HR Outcomes	Extent to which strategy is clearly articulated and well understood throughout the firm	Becker *et al*. (2001)
68	HR Outcomes	Extent to which the average employee understands how his or her job contributes to the firm's success	Becker *et al*. (2001)
69	HR Outcomes	Extent to which senior management sees employees as a source of value creation versus a cost to be minimized	Becker *et al*. (2001)

70	HR Outcomes	Extent to which the executive leadership is visionary	Becker *et al*. (2001)
71	HR Outcomes	Extent to which the firm attempts to provide job security, even if confronted with declining financial performance	Becker *et al*. (2001)
72	HR Outcomes	Extent to which the firm's decision making style can be described as participative	Becker *et al*. (2001)
73	HR Outcomes	Extent to which the firm's HR professionals are generally perceived to be administrative experts	Becker *et al*. (2001)
74	HR Outcomes	Extent to which the firm's HR professionals are generally perceived to be employee champions	Becker *et al*. (2001)
75	HR Outcomes	Extent to which the firm's HR professionals are generally perceived to be agents for change	Becker *et al*. (2001)
76	HR Outcomes	Extent to which the firm's HR professionals are generally perceived to be business partners	Becker *et al*. (2001)
77	HR Outcomes	Extent to which line managers generally believe that effective diversity management is a business imperative	Becker *et al*. (2001)
78	HR Outcomes	Extent to which top management shows a commitment to-and leadership in knowledge sharing	Becker *et al*. (2001)
79	HR Outcomes	Extent to which the firm has developed and communicated measures of financial performance	Becker *et al*. (2001)
80	HR Outcomes	Extent to which the firm has developed and communicated measures of customer reactions	Becker *et al*. (2001)
81	HR Outcomes	Extent to which the firm has developed and communicated measures of key business processes	Becker *et al*. (2001)
82	HR Outcomes	Extent to which the firm has developed and communicated measures of learning and growth	Becker *et al*. (2001)
83	Efficiency measures	Number of hires per recruiting source (by quality)	Moustakis. (2005)
84	Efficiency measures	Percentage of and number of employees involved in training	Moustakis. (2005)
85	Efficiency measures	Turnover by recruiting source	Moustakis. (2005)
86	Performance driver measures	Access to business information to facilitate decision making	Moustakis. (2005)
87	Performance driver measures	Adherence by the workforce to core values, such as cost consciousness	Moustakis. (2005)
88	Performance driver measures	Average change in performance appraisal rating over time	Moustakis. (2005)
89	Performance driver measures	Change in employee mind set	Moustakis. (2005)
90	Performance driver measures	Climate surveys	Moustakis. (2005)

91	Performance driver measures	Consistency and clarity of messages from top management and from HR	Moustakis. (2005)
92	Performance driver measures	Customer complaints/praise	Moustakis. (2005)
93	Performance driver measures	Customer satisfaction with hiring process	Moustakis. (2005)
94	Performance driver measures	Degree of financial literacy among employees	Moustakis. (2005)
95	Performance driver measures	Degree to which a "shared mind-set" exists	Moustakis. (2005)
96	Performance driver measures	Diversity of race and gender by job category	Moustakis. (2005)
97	Performance driver measures	Effectiveness of information sharing among departments	Moustakis. (2005)
98	Performance driver measures	Effectiveness of performance appraisal processes for dealing with poor performers	Moustakis. (2005)
99	Performance driver measures	Employee commitment survey scores	Moustakis. (2005)
100	Performance driver measures	Employee competency growth	Moustakis. (2005)
101	Performance driver measures	Employee development advancement opportunities	Moustakis. (2005)
102	Performance driver measures	Employee job involvement survey scores	Moustakis. (2005)
103	Performance driver measures	Employee satisfaction with advancement opportunities, compensation, etc.	Moustakis. (2005)
104	Performance driver measures	Employee turnover by performance level and controllability	Moustakis. (2005)
105	Performance driver measures	Extent of cross-functional teamwork	Moustakis. (2005)
106	Performance driver measures	Extent of organizational learning	Moustakis. (2005)

107	Performance driver measures	Extent of understanding of the firm's competitive strategy and operational goals	Moustakis. (2005)
108	Performance driver measures	Extent to which employees have ready access to the information and knowledge that they need	Moustakis. (2005)
109	Performance driver measures	Extent to which required employee competencies are reflected in recruiting, staffing, and performance management	Moustakis. (2005)
110	Performance driver measures	Extent to which employees are clear about the firm's goals and objectives	Moustakis. (2005)
111	Performance driver measures	Extent to which employees are clear about their own goals	Moustakis. (2005)
112	Performance driver measures	Extent to which hiring, evaluation, and compensation practices seek out and reward knowledge creation and sharing	Moustakis. (2005)
113	Performance driver measures	Extent to which HR is helping to develop necessary leadership competencies	Moustakis. (2005)
114	Performance driver measures	Extent to which HR does a thorough job of pre-acquisition soft asset due diligence	Moustakis. (2005)
115	Performance driver measures	Extent to which HR leadership is involved early in selection of potential acquisition candidates	Moustakis. (2005)
116	Performance driver measures	Extent to which HR measurement systems are seen as credible	Moustakis. (2005)
117	Performance driver measures	Extent to which information is communicated effectively to employees	Moustakis. (2005)
118	Performance driver measures	Extent to which the average employee can describe the firm's HR strategy	Moustakis. (2005)
119	Performance driver measures	Extent to which the average employee can describe the firm's strategic intent	Moustakis. (2005)
120	Performance driver measures	Extent to which the firm shares large amounts of relevant business information widely and freely with employees	Moustakis. (2005)
121	Performance driver measures	Extent to which the firm has turned its strategy into specific golas/objectives that employees can act on in the short and long run	Moustakis. (2005)
122	Performance driver measures	Percentage of employees making suggestions	Moustakis. (2005)

123	Performance driver measures	Percentage of suggestions made employees that are adopted	Moustakis. (2005)
124	Performance driver measures	Percentage of female and minority promotions	Moustakis. (2005)
125	Performance driver measures	Percentage of intern conversion to hires	Moustakis. (2005)
126	Performance driver measures	Percentage of workforce that is promotable	Moustakis. (2005)
127	Performance driver measures	Percentage of repatriate retention after one year	Moustakis. (2005)
128	Performance driver measures	Percentage of employees with experience outside their current job responsibility or function 45.	Moustakis. (2005)
129	Performance driver measures	Percentage of retention of high performing key employees	Moustakis. (2005)
130	Performance driver measures	Percentage of consistent and equitable treatment of all employees	Moustakis. (2005)
131	Performance driver measures	Percentage of newly hired applicants	Moustakis. (2005)
132	Performance driver measures	The ratio of HR employees to total employment	Moustakis. (2005)
133	Performance driver measures	Requests for transfers per supervisor	Moustakis. (2005)
134	Performance driver measures	Retention rates of critical human capital	Moustakis. (2005)
135	Overall Workforce Productivity	Percentage improvement in workforce productivity. Improvement in dollars spent on people costs for every dollar of revenue/profit generated (as compared to last year)	Sullivan. (2004)
136	Overall Workforce Productivity	The dollar value of the increased workforce productivity between this year and last year	Sullivan. (2004)
137	Employee Engagement	The percentage of employees who “look forward to coming to work” everyday (from survey results)	Sullivan. (2004)

138	Employee Engagement	The percentage of employees who feel that their managers exercise expected management behaviors (from survey results relating to two-way communication, challenging and exciting work, exceptional growth and learning, recognition and reward, some degree of control over their job, and knowing that their work makes a difference)	Sullivan. (2004)
139	Recruiting	Number of overall days that key positions were vacant (due to recruiting)	Sullivan. (2004)
140	Recruiting	Average performance appraisal score of new hires (compared to last year for the same job)	Sullivan. (2004)
141	Recruiting	Manager satisfaction with new hires (survey hiring managers; compare results to last year's average)	Sullivan. (2004)
142	Recruiting	The turnover rate of new hires within the first year	Sullivan. (2004)
143	Recruiting	The percentage of diversity hires in managerial and senior positions	Sullivan. (2004)
144	Recruiting	The dollar impact of a bad hire in key positions	Sullivan. (2004)
145	Retention	Overall employee turnover (not recommended)	Sullivan. (2004)
146	Retention	Performance turnover in key jobs (where performance turnover means that top performer turnover is "weighted" more heavily and bottom performer turnover more lightly than average worker turnover)	Sullivan. (2004)
147	Retention	Preventable turnover in key jobs (where a sample exit survey is used to identify the real reasons individuals left the organization and whether the turnover could have been reasonably prevented)	Sullivan. (2004)
148	Retention	Diversity turnover in professional, managerial, and technical positions	Sullivan. (2004)

149	Retention	The dollar impact of employee turnover in key positions	Sullivan. (2004)
150	Retention	Managers' overall satisfaction rate with HR's retention efforts and the impact of these efforts on team productivity (survey of a sample of managers)	Sullivan. (2004)
151	Overall HR Costs	Dollars spent on HR costs for every dollar of revenue generated (compared to last year)	Sullivan. (2004)
152	Manager Satisfaction	Average ranking of all individual HR functions in a manager survey where managers are asked to rate all individual overhead functions specifically on their contribution to productivity and in helping the manager to meet his or her performance goals	Sullivan. (2004)
153	Manager Satisfaction	Estimate of the overall dollar impact of HR as a result of last year's recruiting, retention and productivity improvement (ROI) efforts	Sullivan. (2004)
154	Compensation and Benefits	The number of "cents" in total compensation and benefits costs that it took to generate a dollar of revenue (as an indication of compensation effectiveness, where this year's ratio would be compared to last years ratio)	Sullivan. (2004)
155	Compensation and Benefits	Percentage of employees who are satisfied with their compensation (survey of a sample of employees on their satisfaction with the rewards and the expectations of the firm)	Sullivan. (2004)
156	Compensation and Benefits	Percentage of employees who are rated in the top performance appraisal level and who are paid above the average salary for their position (and vice versa)	Sullivan. (2004)
157	Compensation and Benefits	Percentage of the average employee's pay that is "at risk" based on the employee's on-the-job output	Sullivan. (2004)
158	Compensation and Benefits	Percentage of top-performing employees who resigned for compensation-related reasons (using a post exit survey, identify the percentage of top performers who listed pay issues among their top three reasons for leaving)	Sullivan. (2004)
159	Employee Relations	Percentage of employees who report that they have a bad manager (based on an employee survey, comparing this year's percentage to last years)	Sullivan. (2004)

160	Employee Relations	Turnover percentage of low-performing managers and employees within one year of receiving the low rating	Sullivan. (2004)
161	Employee Relations	Percentage of low-performing employees who are on a performance management program.	Sullivan. (2004)
162	Employee Relations	Percentage of employees who are in any performance management program who improved at least one level on performance appraisal ratings within one year	Sullivan. (2004)
163	Employee Relations	Manager satisfaction with the impact of HR's employee relations efforts on their team's productivity (survey results of a sample of managers)	Sullivan. (2004)
164	Training and Development	Percentage of employees who report that they are satisfied with the learning and growth opportunities provided by the firm (survey of a sample of employees)	Sullivan. (2004)
165	Training and Development	Percentage of employees who report that they are satisfied with on-the-job learning, project assignments for growth and development, and job rotations (survey of a sample of employees)	Sullivan. (2004)
166	Training and Development	Percentage of employees who report that they are in the leading edge of knowledge in their profession (survey of a sample of employees)	Sullivan. (2004)
167	Training and Development	Percentage of new hires that report excellent training opportunities among the top three reasons they accepted the job (survey of new hires in which they force-rank their job acceptance factors)	Sullivan. (2004)
168	Generalist Activities	Percentage of managers who are satisfied with generalists (survey of all managers who are serviced by generalists)	Sullivan. (2004)
169	Generalist Activities	Average percentage improvement in workforce productivity (ratio of employee costs to dollar value of output) within the divisions that each generalist serves	Sullivan. (2004)
170	Generalist Activities	Employee referral rates in their business unit, as an indication of employees' willingness to recommend others to the firm	Sullivan. (2004)
171	HR Goals Met	Percentage of top priority HR goals that were met or exceeded during the year (goals are set, quantified, prioritized, and approved by senior management at the beginning of the fiscal year)	Sullivan. (2004)

172	Human Capital Effectiveness	Revenue Factor (Revenue / headcount)	Bontis *et al.* (2002)
173	Human Capital Effectiveness	Expense Factor (Operating Expenses / headcount)	Bontis *et al.* (2002)
174	Human Capital Effectiveness	Income Factor (Profit / headcount)	Bontis *et al.* (2002)
175	Human Capital Effectiveness	HC ROI (Revenue – (Expenses – Compensation)) / Compensation	Bontis *et al.* (2002)
176	Human Capital Valuation	Compensation Revenue Factor (Compensation Cost / Revenue)	Bontis *et al.* (2002)
177	Human Capital Valuation	Compensation Expense Factor (Compensation Cost / Expenses)	Bontis *et al.* (2002)
178	Human Capital Valuation	Compensation Factor (Compensation Cost / headcount)	Bontis *et al.* (2002)
179	Human Capital Valuation	Executive Compensation (Executive Compensation / # of executives)	Bontis *et al.* (2002)
180	Human Capital Valuation	Supervisory Compensation (Supervisor Compensation / # of supervisors)	Bontis *et al.* (2002)
181	Human Capital Investment	Development Rate (Employees trained / headcount)	Bontis *et al.* (2002)
182	Human Capital Investment	Training Investment (Training cost / total headcount)	Bontis *et al.* (2002)
183	Human Capital Investment	Training Cost Factor (Training cost / # employees trained)	Bontis *et al.* (2002)
184	Human Capital Depletion	Voluntary Turnover (Voluntary separations / headcount)	Bontis *et al.* (2002)
185	Human Capital Depletion	Involuntary Turnover (Involuntary separations / headcount)	Bontis *et al.* (2002)
186	Human Capital Depletion	Total Separation Rate (Total separations / headcount)	Bontis *et al.* (2002)
187	Right HR practices	Average differential in merit pay awards between high-performing and low performing employees	Huselid *et al.* (2005)

188	Right HR practices	Avg NPV of employee suggestions	Huselid *et al*. (2005)
189	Right HR practices	Avg merit increase granted by job performance	Huselid *et al*. (2005)
190	Right HR practices	Avg time for managers to respond to suggestions	Huselid *et al*. (2005)
191	Right HR practices	Current oercentile ranking on total compentation for A players	Huselid *et al*. (2005)
192	Right HR practices	Current percentile ranking on total compensation for C players	Huselid *et al*. (2005)
193	Right HR practices	Extent to which the workforce has access to business information to facilitate decision making	Huselid *et al*. (2005)
194	Right HR practices	Extent to which a validated competency model is used as the basis for hiring, developing, managing, and rewarding employees	Huselid *et al*. (2005)
195	Right HR practices	Interviews-per-offer ratio in A positions (selection ratio)	Huselid *et al*. (2005)
196	Right HR practices	Customer satisfaction with hiring process	Huselid *et al*. (2005)
197	Right HR practices	Exit rate of C players in A positions	Huselid *et al*. (2005)
198	Right HR practices	Exit rate of C players in B and C positions	Huselid *et al*. (2005)
199	Right HR practices	Extent to which all performance appraisals contain specific, written development plan	Huselid *et al*. (2005)
200	Right HR practices	Total compensation market percentile for a players	Huselid *et al*. (2005)
201	Right HR practices	Firm salary/competitor salary ratio	Huselid *et al*. (2005)
202	Right HR practices	Firm's target percentile for total compensation for A positions	Huselid *et al*. (2005)
203	Right HR practices	Firm's target percentile for total compensation for B positions	Huselid *et al*. (2005)

204	Right HR practices	Firm's target percentile for total compensation for C positions	Huselid *et al*. (2005)
205	Right HR practices	Frequent and quality of employee survey and feedback	Huselid *et al*. (2005)
206	Right HR practices	Hr employees/total employment	Huselid *et al*. (2005)
207	Right HR practices	Impact of workforce development initiatives on specific needed capabilities and behaviors	Huselid *et al*. (2005)
208	Right HR practices	Incentive compensation differential (low versus high performers)	Huselid *et al*. (2005)
209	Right HR practices	Job offers to A player rejected (or accepted)	Huselid *et al*. (2005)
210	Right HR practices	Number and quality of cross-functional teams	Huselid *et al*. (2005)
211	Right HR practices	Number and quality of performance appraisal discussions per year	Huselid *et al*. (2005)
212	Right HR practices	Number and type of "special projects" to develop high potential employees	Huselid *et al*. (2005)
213	Right HR practices	Number of exeptional candidates for each strategic job opening	Huselid *et al*. (2005)
214	Right HR practices	Number of hours of training typically received by a new employee in the first year of employment	Huselid *et al*. (2005)
215	Right HR practices	Number of hoursof training typically received by an experienced employee each year	Huselid *et al*. (2005)
216	Right HR practices	Number of qualified applicants per hire for our most important hires	Huselid *et al*. (2005)
217	Right HR practices	Number of suggestions for improvement made(or implemented) per employee	Huselid *et al*. (2005)
218	Right HR practices	Number of suggestions genereted and/or implemented	Huselid *et al*. (2005)
219	Right HR practices	Percent of exempt and nonexempt employees eligible for annual cash or deffered incentive plans, or for profit sharing	Huselid *et al*. (2005)

220	Right HR practices	Percent of all new hires selected based primarily on validated selection methods	Huselid *et al*. (2005)
221	Right HR practices	Percent A players promoted per year	Huselid *et al*. (2005)
222	Right HR practices	Percent C players promoted per year	Huselid *et al*. (2005)
223	Right HR practices	Percent employee understandinh of non-financial performance drivers	Huselid *et al*. (2005)
224	Right HR practices	Percent employees whose pay is performance-contingent	Huselid *et al*. (2005)
225	Right HR practices	Percent employees with development plans	Huselid *et al*. (2005)
226	Right HR practices	Percent of A positions filled with A players	Huselid *et al*. (2005)
227	Right HR practices	Percent of all employees involved in 360-degree feedback process	Huselid *et al*. (2005)
228	Right HR practices	Percent of communication budget spent on education of employees on strategic intend	Huselid *et al*. (2005)
229	Right HR practices	Percent of employees in A positions with temporary (outsourced) contracts	Huselid *et al*. (2005)
230	Right HR practices	Percent of employees in C positions with temporary (outsourced) contracts	Huselid *et al*. (2005)
231	Right HR practices	Percent of employees willing to recommend our firm to friends as a great place to work	Huselid *et al*. (2005)
232	Right HR practices	Percent of executive time spent on mentoring and coaching	Huselid *et al*. (2005)
233	Right HR practices	Percent of new hires selected based on the results of a validated selection test (i.e., aptitude, skill, or work sample)	Huselid *et al*. (2005)
234	Right HR practices	Percent of non-entry-level jobs that have been filled from within in recent(i.e., over tha last five) years	Huselid *et al*. (2005)
235	Right HR practices	Percent of positions filled by employees refferals	Huselid *et al*. (2005)

236	Right HR practices	Percent of the average employees' total compensation (wages + benefits) that is accounted for by all forms of variable pay	Huselid *et al*. (2005)
237	Right HR practices	Percent of the workforce for which A and C performance evaluation have been accurately assesed	Huselid *et al*. (2005)
238	Right HR practices	Percent of workforce that has merit increase or incentive paydetermined by a performance appraisal	Huselid *et al*. (2005)
239	Right HR practices	Percent of workforce that is eligible for annual cash or deferred incentive pay plans, profit-sharing plans, and/or gain sharing plans	Huselid *et al*. (2005)
240	Right HR practices	Percent of workforce that is included in a formal information-sharing program designed to communicate criticel business and operational goals	Huselid *et al*. (2005)
241	Right HR practices	Percent of workforce that is reguarly(ie. Superiors, subordinates, customers)	Huselid *et al*. (2005)
242	Right HR practices	Percent of merit pay that is determined by a formal performance appraisal	Huselid *et al*. (2005)
243	Right HR practices	Percent employees with access to appropriate training and development opportunities	Huselid *et al*. (2005)
244	Right HR practices	Percent employee development plans completed	Huselid *et al*. (2005)
245	Right HR practices	Percent new meterial in training programs each year	Huselid *et al*. (2005)
246	Right HR practices	Percent of employees making suggestions	Huselid *et al*. (2005)
247	Right HR practices	Percent of employees with experience outside their current job responsibility or function	Huselid *et al*. (2005)
248	Right HR practices	Percent of workforce that is promotable	Huselid *et al*. (2005)
249	Right HR practices	Percent performance appraisals completed on time	Huselid *et al*. (2005)
250	Right HR practices	Perception of consistent and equitable treatment of all employees	Huselid *et al*. (2005)
251	Right HR practices	Performance of newly hired applicants	Huselid *et al*. (2005)

252	Right HR practices	Planned development opportunities accomplished	Huselid *et al*. (2005)
253	Right HR practices	Percent of workforce that routinely performs its job as part of a self-managed cross-functional, or project team	Huselid *et al*. (2005)
254	Right HR practices	Percent of total compensation for your exempt and nonexempt employees represented by variable pay	Huselid *et al*. (2005)
255	Right HR practices	Percent of training resources devoted to multiskillling	Huselid *et al*. (2005)
256	Right HR practices	Percent of your HR budget that is spent on outsourced activities (eg. Recruiting and payroll)	Huselid *et al*. (2005)
257	Right HR practices	Percent regrettable turnover	Huselid *et al*. (2005)
258	Right HR practices	Percent retension of high-performing key empoyees	Huselid *et al*. (2005)
259	Right HR practices	Percent total salary at risk	Huselid *et al*. (2005)
260	Right HR practices	Percentage merit increase a high-performance employee normally could expect as a result of performance review	Huselid *et al*. (2005)
261	Right HR practices	Percentage merit increase a low-performance employee normally could expect as a result of performance review	Huselid *et al*. (2005)
262	Right HR practices	Proportion of absenteeism	Huselid *et al*. (2005)
263	Right HR practices	Proportion of internal transfers	Huselid *et al*. (2005)
264	Right HR practices	Quality of applicants provided by recruiting channel	Huselid *et al*. (2005)
265	Right HR practices	Quality of coaching and mentoring activities	Huselid *et al*. (2005)
266	Right HR practices	Quality of employee feedback systems	Huselid *et al*. (2005)
267	Right HR practices	Range(distribution) of performance appraisal ratings	Huselid *et al*. (2005)

268	Right HR practices	Range in merit increase granted by classification	Huselid *et al*. (2005)
269	Right HR practices	Retention rate of A players in key positions	Huselid *et al*. (2005)
270	Right HR practices	Retention rate of A players in noncore positions	Huselid *et al*. (2005)
271	Right HR practices	Selection ratio: number of qualified applicants per hire	Huselid *et al*. (2005)
272	Right HR practices	Senior manager and board member diversity	Huselid *et al*. (2005)
273	Right HR practices	Success rate of external hires	Huselid *et al*. (2005)
274	Right HR practices	Suggestion system and feedback process	Huselid *et al*. (2005)
275	Right HR practices	Time to competence for new hires	Huselid *et al*. (2005)
276	Right HR practices	Time to promotion for A players	Huselid *et al*. (2005)
277	Right HR practices	Time to promotion for C players	Huselid *et al*. (2005)
278	Right HR practices	Total compensation market percentile for C players	Huselid *et al*. (2005)
279	Right HR practices	Turnover of high-potential minority candidates	Huselid *et al*. (2005)
280	Right HR practices	Unemployement insurance experience rating	Huselid *et al*. (2005)
281	HR workforce competencies	Degree to which HR professionals are effective advocates for employees	Huselid *et al*. (2005)
282	HR workforce competencies	Degree to which HR professionals are effective in facilitating change	Huselid *et al*. (2005)
283	HR workforce competencies	Degree to which HR professionals are effective in providing operational excellence in HR	Huselid *et al*. (2005)

284	HR workforce competencies	Degree to which HR professionals are effective strategic partners with line managers	Huselid *et al*. (2005)
285	HR workforce competencies	HR manager ratings on validating 360-degree competency assessment tool	Huselid *et al*. (2005)
286	HR workforce competencies	HR workforce's level of understanding of criticalness of HR toolkit integration (survey response rate)	Huselid *et al*. (2005)
287	HR workforce competencies	HR workforce's perception of HR's toolkit integration (practice by practice)	Huselid *et al*. (2005)
288	HR workforce competencies	HR leadership bench strenght	Huselid *et al*. (2005)
289	HR workforce competencies	Individual recruiter productivity	Huselid *et al*. (2005)
290	HR workforce competencies	Management satisfaction with HR contrubutions to organizational transformation efforts	Huselid *et al*. (2005)
291	HR workforce competencies	Number of days of professional HR development per HR professional	Huselid *et al*. (2005)
292	HR workforce competencies	Percent of HR budget devoted to "HR for HR"-professional development for HR staff	Huselid *et al*. (2005)
293	HR workforce competencies	Percent of HR professionals with graduate degrees in HR	Huselid *et al*. (2005)
294	HR workforce competencies	Percent of HR professionals with PHR or SPHR certification	Huselid *et al*. (2005)

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