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**International Organizations and Operations:
An Analysis of Cross-Cultural Communication Effectiveness and
Management Orientation**

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ABSTRACT

The global environment of business has become exceedingly complex as more and more corporations and private entrepreneurs compete to expand their market-share and differentiate their brands in the world marketplace. Globalization has increased consumer awareness, created new demands and standards, and made nations more interdependent. It is now imperative that businesses in different countries increase their sensitivity and respect for one another's cultural differences in order to benefit from the growth of international business in the twenty- first century. Studies indicate that effective cross-cultural management, communication, and negotiations should be emphasized by high-growth multinational corporations competing for global expansion. Corporations that have embraced appropriate acculturation strategies, employed effective cultural awareness model, and avoided ethnocentric management style in their expansion and growth efforts have been successful. Other studies identified the major causes of the demise of global business ventures, citing their managers' lack of intercultural skills, failure to engage in cross-cultural exchange, inability to communicate effectively in the global marketplace, unacceptable practice of business ethics and etiquette, and absence of compromise agreement. Global managers should establish cross-cultural training in their facilities in order to increase effectiveness across cultures, become efficient cross-cultural negotiators, and sensitize to the values of counterparts. This study provides an analytical framework and recommendations for adaptation of multinational management strategies for sustainable business competitiveness in the current wake of global economy.

Keywords: International Organizations, Cross-Cultural Communication, Intercultural Negotiation, Multinational Skills, Globalization, Global Economy.

International Organizations and Operations: An Analysis of Cross-Cultural Communication Effectiveness and Management Orientation

INTRODUCTION

With the globalization of economies, production and consumption activities, and markets, it has become increasingly important that managers at all levels develop sensitivity to cross-cultural communication, intercultural negotiation, and decision-making. The process of making decisions, reaching agreements, and building consensus has changed requiring an understanding of cross-cultural communication competence. As corporations are establishing subsidiaries, forming strategic alliances, and opening joint ventures in many parts of the world, individuals in the professional and managerial ranks should be trained in the skills of cross-cultural communication competencies. Recent global trends and events are positioning business etiquette and cross-cultural communication as critical management issues because of the increasing number of businesses involved in multinational ventures, strategic alliances, and joint ventures. Because of the impact of globalization, an increasing number of corporations from many parts of the world are striving to establish global brand and cultivate multinational consumer awareness in order to sustain their competitive advantage. Further, the environment of business has become equally complex and challenging as a result of cross-cultural communication, differing standards and expectations, and issues associated with management ethics.

The twenty-first century globally-interdependent economy strongly indicates that business leaders and international entrepreneurs provide opportunities for their managers to travel abroad to engage in cross-cultural communication so that they will acquire the necessary skills and orientation for coping with cultural differences. This global exposure enables managers to relate effectively with citizens of other countries in an effort to take advantage of the opportunities available in culturally-diverse marketplace. Harris and Moran (2008) noted that the corporate culture of global organizations affects how businesses cope with competition and change whether in terms of technology or economics. Managers operating in multinational environments must be cultural sensitive, understand the implications of cultural synergy, and be adequately prepared for global culture. Yu (2007) pointed out that as businesses globalize, there continues to be a compelling need for standardization in organizational design, management strategies, and communication patterns because managers will find themselves faced with multiple challenges originating from domestic and cultural issues and socio-economic systems. Adaptation is critical and essential for corporate success.

International business etiquette as defined by Chaney and Martin (2007) refers to the manners and behaviour considered acceptable behaviour in internationally social and business situations. In social setting, proper social

behaviour includes cultural differences in making introductions, exchanging business cards, acknowledging position and status, communicating inter-culturally, dining practices, tipping etiquette, giving gifts, and travelling. In international business situations, how competent and competitive firms are both domestically and internationally and how they effectively communicate to their stakeholders will determine how successful a firm is internationally. Furthermore, as the authors expound, building global business relationships depends on the innate ability to learn about other cultures and proper training to help a person adjust once he or she is in another culture. In addition, it refers to the customs and regulations dealing with diplomatic courtesies expected in official negotiations with persons in various cultures. Chaney and his colleague explain that when interacting with colleagues or counterparts of other cultures in a business or marketing context, it is important to know their customs to ensure that an intended meaning is not conveyed in order to avoid unintentionally offending them. Furthermore, other scholars (O'Rourke, 2010; Cardon & Scott, 2003; Brett, 2001) see global business etiquette as a natural outgrowth of business globalization, which in many significant ways complicate the way people from different backgrounds in organizational and learning contexts behave in business situations. They explain that employees who work globally should be trained in technical knowledge, such as import and export laws of other countries, comparative management styles, and business protocol, etiquette, and ethics.

MULTINATIONAL CONTEXT OF MANAGEMENT AND CROSS-CULTURAL COMMUNICATION

Management and communication scholars (Chaney & Martin 2011; Harris & Moran, 2000) agree that international management skills are needed for the increasing scope of global trades and investments over the past decade. A number of the major multinational corporations have expanded their operations throughout developed and developing nations. Some of the businesses are direct investments and others are partnership arrangements and strategic alliances with domestic operations. Studies indicate that independent entrepreneurs and small businesses have started investing and competing in global marketplaces. Therefore, the current global trend of business competitiveness strongly indicates a need for the development of strategic framework for managing, negotiating, and communicating across cultures in order to achieve the investment objectives of corporations. Indeed, as Chaney & Martin (2011) pointed out, awareness and cultural differences is increasingly significant to the success of multinational corporations. A good understanding and appreciation of the culture in which business is conducted can make international managers both effective and productive. Hodgetts and Luthans (1997) noted the concerns of some organizations when internationalization began in the 1970s that it would be exceedingly difficult to conduct business in the same fashion around the world as a

result of cultural variations and differences. Indeed, the attempt to manage people the same way across cultures presented serious challenges to many global businesses.

Studies conducted over the past decade stressed the importance of training managers on cross-cultural negotiation skills as well as cross-cultural communication competence. Globalization has become a megatrend in the present business environment, making it extremely critical that management teams be equipped with the appropriate global mindset and cross-cultural values in order to effectively lead a diverse workforce. Deresky (2006) stressed the concept of cultural convergence, the shifting of individual management styles to accommodate the styles used in other environments and total elimination of parochialism, stereotyping, and ethnocentrism in managing multinational operations. An analysis of the growth of multinational corporations in the wake of globalization (Chaney & Martin, 2011) identified several factors that have been instrumental to the inability of managers to succeed in a global context. Chief among these factors are ethnocentric predisposition, cultural imperialism, and parochialism in managing a diverse or multicultural workforce. Essentially, it is counter-productive to lead international organizations with a mindset characterized by these types of negative values.

Recent developments show that many businesses are cultivating a global focus by sourcing, producing, importing, or exporting their goods and services around the globe, which makes intercultural communication and negotiation gain substantial prominence in the international business management. Further, international business etiquette (the expected rules of behaviour for intercultural communication and management) has become increasingly important because of the mobility of people. Authors Bovee and Thill (2010) stressed that learning the skills of proper etiquette in preparation for international assignment is one of the critical requirements for business success in a competitive context. As the authors stated, some behavioural rules are formal and specifically articulated and others are informal and learned over time which influences the overall behaviour of majority of people in a society most of the time. It is noted that as managers appreciate, value, and respect cultural differences, they develop a better understanding of people's behavioural patterns which gives them a much better understanding of how to properly interact while conducting business.

Similarly, O'Rourke (2010) identified the most common factors contributing to managers' failure to perform effectively in international business assignments as the inability to understand and adapt to foreign ways of thinking and acting as opposed to technical or professional incompetence. As interest in participation in the global marketplace increases, managers are required to adapt to new cultures and to become sensitive to differences among people. Bovee and Thill (2011) added that supervisors face the challenge of acknowledging the

expected behaviours of diverse employees, multinational teams face the problem of working together closely, and businesses have the difficult task of peacefully negotiating with international business counterparts. Thus, the suggested strategic globalization imperative for international business undertaking requires a practical analysis and application.

CROSS-CULTURAL NEGOTIATION: CHALLENGES AND STRATEGIES

Developing global management skills is as demanding as applying cross-cultural negotiation and decision-making. Managers preparing for multinational assignments should prepare for skills in strategic negotiations and cross-cultural interactions. The process of negotiation is culture-specific and involves a great deal of sensitivity. Deresky (2006) noted that the ability to conduct cross-cultural negotiations cannot be over-stated, which places global managers in a position to learn the complexities associated with cultural nuances and values. Additionally, Carte & Fox (2008) highlighted the inherent difficulties in international business because of the need to understand cultural and regulatory variations. For instance, international business etiquette requires the ability to adapt to different national processes, patterns, and acculturations. It should be noted that competitive positioning and long-term effective business operations in a multinational environment involve a sound knowledge of negotiating processes and decision-making strategies of managers from different parts of the world.

Studies have suggested the importance of international managers to understand how culture affects negotiations with global business partners. As Movius, Matsuura, Yan, and Kim (2006) noted, it is a gross fallacy to make the assumption that individuals who come to negotiation meetings demonstrate “single culture” norms, since they often have extensive international experience either through work or education or probably from a multicultural and multilingual family, and thus have some acquaintance with various cultures. To achieve a desirable result in international negotiations, Salacuse (1998) stressed that global managers should be adequately grounded in intercultural communication and compromises. They should not only understand their own objectives in the negotiation, but should know their parameters in the decision-making process. They should also understand that information may be presented in different forms and be prepared to tolerate ambiguity and a reasonable level of inconsistency. As Chaney and Martin (2011) cited, in high-context cultures, such as Japan, meaning is conveyed through body language, pauses, rephrasing as much as in the words used at negotiation meetings, whereas in a high-context culture of the United States, meaning is conveyed mainly through spoken words. In cross-cultural negotiation, both verbal and nonverbal communication is critically important and

may affect reactions and flow of conversations. Similarly, mixed messages create uncomfortable feelings for international managers as they may be struggling to reconcile the inconsistencies. For instance, in the United States, direct eye contact is expected and is seen as a measure of honesty, trustworthiness, and reliability. Conversely, in China and in some parts of Africa, direct eye contact is considered rude and inappropriate. Additionally, direct eye contact with a superior or senior person demonstrates disrespect and hostility in India. Cross-cultural communications skills are essentials to achieving effective and productive international negotiations. Over time, negotiations involving managers from different backgrounds have not yielded much result because of the tone of conversation, facial expressions and other culture-specific nonverbal cues. Therefore, international managers should be equipped with the appropriate knowledge and competence to manage complex situations that arise from cultural differences.

CROSS-CULTURAL COMMUNICATION: CHALLENGES AND STRATEGIES

Several studies (Thill & Bovee, 2011; O'Rourke, 2011) indicate a strong correlation between effective international management and cross-cultural communication. It is stressed that a sound intercultural communication is vital for international managers as well as for domestic managers of multicultural and multinational businesses. Miscommunication, misinterpretation, or misunderstanding is more likely to take place among managers and employees from different ethnic backgrounds and nationalities than among the managers and people from homogenous backgrounds. The ability to communicate cross-culturally is required of managers who aspire to succeed in global assignments. Managers preparing to work in a domestic business with a diverse workforce or who are preparing to work in foreign environments should be adequately flexible and trained to adjust their communication pattern to the intended audience.

The increasing emphasis on workforce diversity in recent years makes it extremely important that domestic and global managers should devote more time to learning appropriate communication strategies, especially for effective management of a diverse organization. Communication is an essential part of a manager's duty and it takes up much of his or her time either interpersonally or with a group of employees. Effective intercultural communication largely determines the success of international transactions or the performance and productivity of a culturally diverse workforce. Communication scholars have determined that culture is the foundation of communication, and essentially communication conveys culture. As Deresky explained, effective cross-cultural

communication explains whether or not the receiver is from a country with a monochronic or a polychronic time system, high-context or low-context environment.

Furthermore, managing intercultural communication effectively in organizations requires that managers develop cultural sensitivity, be careful in encoding their messages, thoughtful in decoding and analyzing content and context, selective in choosing channels for transmission of messages. The increasing mobility of workers in global markets, expansion of international joint ventures and strategic alliances, and the presence of global entrepreneurs in developing nations makes cross-cultural communication competence inevitable. As businesses strive to achieve competitive advantage both domestically and globally, equipping managers with the critical communication skills enhances performance and improves the quality of relationships. A number of studies indicate that cross-cultural communication skills or behaviour can be learned to increase the effectiveness of managers with host nationals. Improved cross-cultural communication in organizations reduces the challenges in international management

A COMPARATIVE ANALYSIS OF GLOBAL BUSINESS ETIQUETTE

Communication scholars have emphasized the vital role of etiquette in international management environment as well as in cross communication situations. Managing a multicultural workforce requires a proper conduct of oneself at all times. In today's hectic and competitive society, etiquette might be taken for granted or seen as outdated concept, but it affects perceptions and decisions people make in the global context of management. It is never over-emphasized that the ways a manager conducts himself/herself and interacts with colleagues have a profound impact on a company's goodwill or credibility. In addition to effective cross-cultural communication and negotiation skills, proper business etiquette accounts for success of domestic and global managers. Bovee and Thill (2011) and Chaney and Martin (2011) in their analysis of the importance of managers' self-conduct, grooming and appearance, and comportment consistently stated that business etiquette is a major criterion in evaluating performance and overall success in a global workplace. Etiquette includes a variety of behaviours, habits, and specific aspects of nonverbal communication.

Carte & Fox (2008) and Yu (2007) caution that with the tremendous surge in global business ventures these days, it is vital to learn more about the different cultures and behaviours around the world in order to reduce the risk of managerial failure. To effectively adapt business etiquette to businesspersons from other countries requires both knowledge about the culture and the ability and motivation to adapt to different behaviours. For example, the giant retailer Wal-Mart learned

this lesson the hard way when it expanded its operations into Germany. Notably, store clerks resisted Wal-Mart's culture of always smiling at customers, because some customers sometimes misunderstood and misinterpreted smiling as flirting. Because of a number of other cultural missteps, Wal-Mart had to leave the German marketplace (Bovee and Thill, 2011). Indeed, becoming aware and sensitive to different countries' business etiquette is the key to establishing good business relationships with individuals and businesses in many countries. The significance of business etiquette is highlighted by analyzing four selected countries that have conducted businesses in the United States over the years.

Earley (1997) notes that business etiquette in the People's Republic of China is the most reserved and most unlike the United States, out of the four countries included in this cultural analysis. To the United States businessperson, a personal relationship should be separated from business. Friendships are quickly formed and dissolved. Hence, many view the U.S. business relationship as shallow and short-termed, while business relationships in China are viewed as lifetime commitments (Martin & Chaney, 2011). Further, Chinese business etiquette is directly related to the Chinese sensitivity to face. Ting-Toomey & Kurogi (1998) and Earley (1997) refer to face as an evaluation of a person's credibility and self image. The hundreds of phrases in the Chinese language describing face demonstrate the sophistication of face and how it relates to communication behaviours (Cardon & Scott, 2003), such as global business etiquette. The authors further note that Chinese businesspersons employ a number of communication strategies designed to receive face or give face to others, such as indirectness, intermediaries, praising, requests, and shaming. In order to save face, they often try indirectness by avoiding public confrontations. The use of intermediaries avoids direct confrontation, especially in conflict situations, such that a contact should always be established before representatives of business are sent to China. They believe in a win-win negotiation strategy that allows both sides to be winners in order to increase the strength and scope of the relationship. In addition, Cardon and his colleague explained that Chinese businesspersons employ praise to recognize status and position. For example, they often times make direct request for favors because this will signal that a business relationship is firm. Finally, Chinese businesspersons resort to shame when individuals violate the trust of a relationship.

When conducting business in China or in the United States with a person from China, the rules of business etiquette are controlled and determined by face giving and taking. For example, when giving introductions, remember that the surname comes first and the given name last. The introduction is accompanied by a bow which is uncommon in many other cultures (Chaney & Martin, 2011). The authors stress that out of concern for their business partners; many times, the handshake is combined with a bow so that each culture shows the other proper respect. Another example of how face influences Chinese business etiquette is the

importance of the business card exchange. Chinese business cards represent the person to whom you are being introduced, so it is polite to study the card for a while and then put it down as a sign of respect. Furthermore, Chaney and his colleague note that, as a mark of respect and appreciation, the Chinese examine business cards carefully and make some favorable comments while accepting them. During meetings with Chinese, it is a common practice for them to place business cards of others attending the meeting in front of them on the conference table in order to properly refer to names, ranks, and titles. Usually, both hands are used when presenting and receiving cards, and they position cards strategically so that they can be read easily.

Business etiquette in England is based on a strong sense of identity and nationalism. The English businessperson tends to be very matter-of-fact and tends to be very deadline oriented in business negotiations (Chaney & Martin, 2011). Traditions and customs (etiquette) are very important to the English, as they tend to be reserved and expect others to act accordingly. Unlike businesspersons from the U.S., business friendships are not necessary (Morrison et al., 1994). Carte & Fox (2008) note that because of their individualist culture, like the Americans, they focus on the tasks set out in their job description and think it is normal for a boss to reward individual effort. The English businesspersons' reputation of reserve is well deserved, thus so manifesting itself in their strict adherence to protocol (Martin & Chaney, 2011) and their ability to confront adversity with courage and strength of character (Harper, 1997). The author also cautions that when conducting business in England, be careful about asking too many personal questions too quickly, partly because it makes them nervous and partly because they are naturally reserved in their culture. The English business person, while having excellent manners, has "lousy" people skills.

When conducting business in England, the rules of business etiquette are controlled and determined by the English businesspersons' reserved character and strong sense of identity (Harper, 1997). For example, Martin & Chaney (2011) explain that conservative attire of excellent quality is important in England when judging dress and appearance. There, as well as, in other European countries, dress is an indication of social and business status. Therefore, it is important to dress your best by selecting clothing made of quality fabrics with fine tailoring in Great Britain. In addition, accessories should be of high quality and reflect good taste. English inappropriate attire includes sweat suits and tennis shoes, which are viewed as appropriate only for athletic activities. The English businesspersons' negotiation processes also reflect their cultural characteristics; they are very formal and polite and place great value on proper protocol and etiquette (Chaney & Martin, 2011). In addition, the authors note that the English can be tough and ruthless negotiators and can sometimes appear quaint and eccentric, many times causing other cultures to underestimate their skill. Mole (1997) adds that the English businesspersons quickly lose reserve when their basic assumptions about

themselves are challenged or questioned.

Troyanovich (1972) interpretation of business etiquette in Germany is based on the formal culture of Germany that defines behavioural expectations in great detail, providing its participants with the knowledge of what to do and when to do it. Similarly, Carte & Fox (2008) noted point out that German businesspersons respect authority and hierarchical differences. They prefer a hierarchical organizational structure because it avoids uncertainty, where power is ensured within the organization. They are autocrats who prefer formal communication when conducting business. In addition, they focus on personal achievements and truth and directness are important aspects in business. Tinsley and Woloshin (1974) add that the ideal person is one who can be relied on to do what is expected and whose behaviour is predictable, steady, and not much influenced by the opinions of others or by opportunity. Further, Martin and Chaney (2011) pointed out that more recent research indicates that class status is important to Germans, and even though all people have equal rights under the law, in reality inequalities exist.

The German businesspersons' strict adherence to behavioural expectations is manifested in their standards of business etiquette. For example, being on time for all business and social engagements is more important to the German culture than any of the six countries surveyed in this paper (Axtell, 1998). Being only a few minutes late for meeting can be insulting to German managers and if you are delayed, an explanatory call is expected. In addition, the German sense of punctuality in all situations has been recognized as one of the most consistent stereotypical characteristics of the culture (Tinsley & Woloshin, 1974). The value of time for the German businessperson is not primarily monetary, however, and there has never been any strong tendency to take time from other activities to increase the amount of time devoted to business affairs. Another example of German business etiquette reflective of their strict adherence to normative behavior is their etiquette for introductions. Martin and Chaney (2011) explain that in Germany, you always use a title when addressing someone until you are told it is okay to use first names. Troyanovich (1972) notes that German businesspersons are very time-conscious and that their preoccupation with punctuality is reflected in the formalized way time is reported to the German public. In agreement, Mole (1999) explains that there is a strong sense that the relationship between the company and the employee is contractual, thus you are paid for so many hours and you work as hard as you can for that period of time.

Bovee and Thill (2010) discusses that Japan's style of business etiquette, as other Asian cultures, is based on their high-context communication. In high-context cultures, people rely less on verbal communication and more on the context of nonverbal actions and environmental setting to convey meaning because so much of the message is carried in cues and "between the lines" interpretation.

These contextual differences are apparent in the way businesspersons in Japan approach situations such as decision making and negotiating. For example, negotiators working on business deals in Japan may spend more time building relationships instead of working out contractual agreements. In other words, protecting the business relationship may be as important as making the final business decision. Martin and Chaney (2011) reported that the use of high-context communication can be very confusing to the uninitiated, nonsensitive intercultural businessperson. For example, the Japanese say “yes” for no but indicate whether “yes” is yes or really no by the context. Similarly, (Carte & Fox, 2008) notes that high context communicators tend to communicate more implicitly. When a Japanese businessperson speaks, they expect the person to interpret what they mean by their knowledge of the cultural values that lie behind the words.

When conducting business meetings in Japan, Bovee and Thill (2011) explain that the rules of etiquette are controlled and determined by their cultural context, the pattern of physical cues, environmental stimuli, and implicit understanding that convey meaning between two members of the same culture. For instance, since the Japanese do not use the word “no” and have such subtle verbal and nonverbal cues, businesspersons from other countries must ask a number of questions to be certain they understand the intent of what is being communicated (Brett, 2001). In addition, (Carte & Fox, 2008; NBEA 2007) argue that the aim at initial business meeting is to develop a personal trust. Much of the time in these meeting is spent exchanging information about the companies in question before discussing specific business proposals. Another example of how Japan’s high-context culture affects their business etiquette is their attitude towards business relationships. As Martin and Chaney (2011) and Watson & Chatterjee (2006) stressed, building relationships and friendships in Japan is a necessary prerequisite for doing business in their country. Signing a contract in Japan, as well as in other Asian cultures, does not signal a sale or negotiation but a continuation of a relationship with obligations and duties in the future. Indeed, each of these countries has a rich tradition of behaviours and customs that contribute to their standards of business behaviour/etiquette and knowing what each expects can aid in improving the business relationships that exists between different cultures.

SUMMARY

As business organizations embark on global ventures and competitiveness, managing cultural differences, inter-cultural communication, and cross cultural negotiation and decision-making are the most common challenge to international management. Success or failure in managing a diverse or multicultural workforce largely depends on the ability of managers at all levels to communicate effectively with people from different backgrounds and nationalities, and showing respect for cultural differences. International business is the outgrowth of globalization which is driven primarily by economic interdependency and advances in technology, but the success in global business ventures will be affected by the inability of international managers to understand appropriate business etiquette, customs, and values needed to conduct business among nations of the world. Indeed, a number of management and communication studies strongly indicate that an understanding cultural differences as well as effective intercultural communication competence will not only help businesses to bridge the communication gap among countries involved in international trade negotiations, but it will also enable multinational and multicultural managers to succeed in their various foreign operations, global joint ventures, and strategic alliances. Because communication is culture-bound and culture specific, it is important that countries involved in international business devote adequate time to learn, understand, and appreciate the different ethical and cultural habits and appropriate etiquette for conducting business transactions on a global scale. The acquisition of these competitive global skills and competences will enable high-growth businesses establish lasting strategic relationships and retain their workforce for longer periods of time. In light of the advantages and complexities associated with globalization and multinational operations, cultivating cross-cultural awareness and skills, and developing multicultural sensitivity and global mindset by managers will lead to sustainable growth in international business.

REFERENCES

- Axtell, R.E. (1998). *Gestures*. New York: Wiley.
- Bovee, C. L., & Thill, J. V. (2010). *Business communication today* (10th ed.). Boston: Prentice Hall.
- Brett, J. E. (2001). *Negotiating globally: How to negotiate deals, resolve disputes, and make decisions across cultural boundaries*. San Francisco: Jossey-Bass.
- Budhwar, P. (2001). Doing business in India. *International business review*, 43 (4), 549-568.
- Cardon, P.W. & Scott, J.C. (2003). Chinese business face: Communication behaviors and teaching approaches. *Business communication quarterly* 66 (4), 9 – 22.
- Carte, P. & Fox, C. (2008). *Bridging the culture gap: A practical guide to international business Communication* (2nd ed.). Philadelphia: Kogan Page.
- Chaney, L.H. & Martin, J.S. (2011). *Intercultural business communication* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Dresky, H (2006). *International management: Managing across borders and cultures*. Pearson/Prentice-Hall Publishing: Upper Saddle River: NJ
- Early, P.C. (1997). *Face, harmony, and social structure: An analysis of organizational Behavior across cultures*. New York: Oxford University Press.
- Harris, P R. & Moran R. T. (2000). *Managing cultural differences*. Gulf Publishing Company: Houston, TX
- Hodgetts, R. M. & Luthans, F. (2002). *International management: Culture, strategy and behavior with world map*. The McGraw-Hill publishers: New York: NY
- Harper, T. (1997) *Passport United Kingdom: Your pocket guide to British business, customs, and etiquette*. Dan Rafael, California: World Trade Press.
- Martin, J.S. & Chaney, L.H. (2006). *Global business etiquette: A guide to international communication and customs*. Westport, Conn: Praeger Publishers.
- Mole, J. *Mind your manners: Managing business cultures in Europe*. London: Nicholas Brealey Publishing.
- Morrison. T., Conaway, W.A., & Borden, G.A. (1994). *Kiss, bow, or shake hands*. Holbrook, MA: Adams Media Corporation.
- Movius, H., Matsuura, M., Yan, J., & Kim, D.Y. (2006, October). Tailoring the mutual gains: Approach for negotiations with partners in Japan, China, and Korea. *Negotiation Journal*, 22(4), 389-435
- National Business Education Association. (2007). *National standards for business education*. (3rd edition). Reston, VA: Author
- O'Rourke, IV, J. S. (2010). *Management Communication* (4thth ed., pp. 280-289). Upper Saddle, Rver, NJ: Pearson Prentice Hall.
- Peterson, B (2004). *Cultural intelligence: A guide to working with people from other cultures*. Yarmouth, ME: Intercultural Press
- Thill, J.V. & Bovee, C. L. (2011). *Excellence in Business Communication*. (9th edition). Prentice Hall publishing: Upper Saddle River, NJ.

- Salacuse, J. (1998, July). Ten ways that culture affects negotiating style: Some survey results.
Negotiation Journal, 221-240.
- Ting-Toomey, S. & Kurogi, A. (1998). Facework competence in intercultural conflict: An updated face-negotiation theory. *International Journal of Intercultural Relations*, 22 (2), 187 – 225.
- Tinsley, R.L. & Woloshin, D.L. (1974). Approaching German culture: A tentative analysis.
Teaching German, 7 (1), 125-136.
- Troyanovich, J. (1972). American meets German-cultural shock in the classroom.
Teaching German, 5 (2), 67-79.
- Watson, A. & Chatterjee, S. (2006, June). Going international: What we can learn about international strategy, market entry, an resource allocation from the game of Go.
Journal of Teaching in International Business, 17(4), 5-26.
- Yu, T. & Cannella, A. (2007, June). Rivalry between multinational enterprises: An event history approach. *Academy of Management Journal*, 50(3), 665-686.

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Did Nongovernmental Monitoring improve Working Conditions in the case of Nike and the Footwear Industry?

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Abstract

This article examines working conditions in the RMG sector of Bangladesh could improve through effective monitoring system. In a significant case Nike suggested that working conditions and labour rights can be improved through a systematic approach and a comprehensive and transparent monitoring system. External pressure from NGOs and other advocacy groups motivated Nike to introduce a Code of Conduct and a monitoring system. The process is discussed in this section.

Keywords: RMG, Code of Conduct, Monitoring System, Nike, Compliance, FLA, SHAPE and MESH.

Methodology

The research also incorporates Literature reviews, Case studies in other countries, Journals, Research articles, Thesis papers, Newspapers, which are secondary sources. Research based on secondary data often runs the risk of being journalistic with the potential of being superficial and can be difficult to analyse. However the research attempts to provide an insight into condition in the industry that avoids this difficulty.

Corporate Codes of Conduct and various efforts aimed at monitoring compliance with these codes have been initiated around the world (NRC, 2008). Monitoring efforts started by effecting corporate or supplier compliance with national regulations and laws, working hours, wages, over time they have increasingly focused on compliance with private, voluntary Codes of Conducts (Richard, Locke, Qin and Brause, 2007). In a significant case Nike suggested that working conditions and labour rights to be improved through applying a systematic approach.

Nike is one of the largest athletic shoe brands in the world. While the company sells millions of shoes and pieces of clothing each year, it does not produce any of these products. Instead, the company contracts with manufacturing facilities located throughout the world. Nearly 800,000 people work in these factories, located primarily in Asia particularly in Indonesia, China, and Vietnam (Beach Emily, 2010). Nike has been criticised for working conditions and low wages at these factories and it has been said that the company is profiting from sweatshop labour (Bambi T., 2008). Following pressure from the public and human rights groups', Nike established a Code of Conducts on labour and environmental practices for its suppliers in 1992. The Code of Conducts now covers more than 900 factories with more than 650,000 workers around the world (Turner, 2008).

Table 1: Codes of Conduct

Standard	Fair Labour Association (FLA)	SA8000	Worldwide Responsible Apparel Production	Workers' rights Consortium (WRC)
Child labour, minimum age	15 or 14 if country of manufacturer allows or age for completing compulsory education.	15 or 14 if meets developing country exemption, or local minimum age if older.	14 or age for completing schooling or minimum age established by law,	15 or 14 if consistent with ILO practices for developing countries.
Harassment and Abuse	No employee shall be subject to any physical, sexual, psychological, or verbal harassment or abuse.	No corporal punishment, mental or physical coercion, or verbal abuse; no sexually coercive or exploitative behaviour.	No harassment, abuse, or corporal punishment in any form.	No employee shall be subject to any physical, sexual, psychological, or verbal harassment or abuse; no corporal punishment.
Non-discrimination	No discrimination in hiring, salary, benefits, advancement, discipline, termination or retirement, on basis of gender, race religion, age, disability, sexual orientation, nationality, political opinion, or social or ethnic origin.	No discrimination in hiring, compensation, access to training, promotion, termination, or retirement based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, or political affiliation.	No discrimination on basis of personal characteristics or beliefs; question about discrimination based on seniority.	No discrimination in employment, including hiring, salary, benefits, advancement, discipline, termination, or retirement, on the basis of gender, race, religion, age, disability, sexual orientation, political opinion, or social or ethnic origin
Freedom of Association and Collective Bargaining	If right restricted by law, employer shall not seek state assistance to prevent workers exercising right to freedom of association.	If right restricted by law, employer facilitates parallel means for free association and bargaining.	Lawful rights of free association, including right to join or not join an association.	No employee shall be subject to harassment, intimidation, or retaliation in efforts to freely associate.
Health and Safety	Safe and healthy working environment is required. Standard	Safe and healthy working environment is required. If	Safe and healthy working environment is required. If	Safe and healthy working environment is required.

	also applies to employer-operated facilities apart from production facilities (e.g., housing).	provided, housing should be clean and safe.	provided, housing should be safe and healthy.	
Wages	Local minimum wage or prevailing industry wage, whichever is higher, and legally mandated benefits.	Legal or prevailing industry wage and meet basic needs and provide discretionary income.	Legal minimum wage.	Legal minimum wage and benefits. WRC code requires paying a <i>living wage</i> .
Standard	8 hours per week and 12 hours overtime or the limits on regular and overtime hours allowed by the law of the country; 1 day off in every 7.	48 hours per week and 12 hours overtime maximum. At least 1 day off in every 7-day period. All overtime work shall be reimbursed at a premium rate.	Legal limitations of apparel production; 1 day off in every 7- day period, except as required to meet urgent business needs.	Limit of working hours (a) 48 hours per week or (b) at least 1 day off in every 7-day period, as well as holidays and vacations.

Source: Richard M. L, Fei Qin, and Brause (2007). Does Monitoring Improve Labour Standards? Lessons from Nike. Industrial and Labour Relations, Review Volume 61 No. 1, October, 2007.

Table 1 illustrates how the standards in the Code of Conducts are related to these standards in the various models used to develop the Nike Code of Conducts. These are FLA, SA8000, WRAP and WRC, respectively. The resultant Nike Code of Conducts as detailed in Appendix –A.

Nike was one of the first companies in the apparel and footwear industries to develop an internal compliance division. Supplier compliance with the code is monitored through a program of internal evaluation conducted first by Nike staff and then reviewed by external accounting, health and safety, and environmental consulting firms. Nike included its own on-staff team of nearly one hundred Inspectors for performing inspections of the company’s partner factories. Inspectors scored the factory on factors ranging from employee safety to humane working conditions. Moreover, the Nike Company allowed frequently factory inspections from the Fair Labour Association and set up independent monitoring with both US and international organizations (Turner, 2008).

In addition Nike has also developed internal monitoring tools, such as SHAPE (Safety, Health, Attitude of Management, People Investment, and Environment) Audit and MESH (Management, Environment, Safety, and Health) Program that allow the company jointly evaluation of labour and environmental issues in relation to management practices and training. MESH resembles the 14000 Management Auditing Program of the International Organization for Standardization further by evaluating actual factory performance. High scorers often receives more lucrative orders, while low scorers risk losing contracts. Nike introduced these labour and environmental programs on long-

standing quality control management systems for evaluating and ranking subcontractors. Requirements to improve labour conditions simply extend the scope of commitments agreed to in the Code of Conducts and subcontractor memorandum of understanding (Turner, 2008). Simultaneously Reebok and Adidas, Nike's main competitors, along with many other prominent footwear and apparel firms, have established similar programs that combine in-house assessment with external audits. Reebok, for instance, has established a worldwide Human Rights Production Standards Factory Performance Assessment System. Adidas also set up *standards of engagement* for fair labour practices and health, safety, and the environment for its sub-contractors. Companies such as Nike, Reebok, and Adidas now repeatedly rate their subcontractors for environmental and labour performance through these auditing tools. In particular, the standards are considered fundamental to workers' abilities to work, workplace safety and environment, labour standards, wages. (Nike) engages in concrete workplace actions to implement sustainable development targets (Bigg, 2002). There is some evidence that Nike, Reebok, and Adidas have cancelled some contracts due to a poor working environment and inadequate labour standards (Richard, Locke, Qin and Brause, 2007). In fact, Nike was motivated to introduce a Code of Conducts and a monitoring system by external pressure from NGOs and other advocacy groups. Nike developed its own internal standard, recruited, trained a professional staff, and implemented a monitoring system (Amin, 2011). Simultaneously, Nike's efforts to improve product quality and develop management practices complemented its efforts to improve monitoring and labour standards.

Conclusion

In conclusion, the Nike case suggests that a non-governmental monitoring system could improve labour standards and the working environment. Nike made efforts to improve working conditions for its contracted workers by introducing COC and developed internal standards through specially recruited and trained professional staff. This staffs monitors the working environment and examines the Code of Conducts in order to verify products certification. As a result, working conditions in the Nike and Footwear industry have improved. In the RMG sector, a Social compliance Certification System could be offered through buyers to promote and certify lawful, humane and ethical working conditions in manufacturing processing, and the working environment.

References:

- Amin, T. (2011). "WRAP as a Social compliance Certificate", *Bangladesh Textile Today*, <http://www.textiletoday.com.bd>, viewed on 05/03/2011
- Bambi, T. (2008). *Facts about Nike Sweatshops*, <http://www.ehow.com> viewed on 04/4/2010
- Beach Emily (2010). *Facts about Nike Sweatshops*, eHow Contributor, http://www.ehow.com/about_5485125_nike-sweatshops.htm
- Bigg, T. (2002). *Core Labour Standards and Human Rights in the Workplace*, Published by International Institute for Environment and Development (IIED) in collaboration with the Regional and International Networking Group (RING), WSSD Coordinator, IIED, 3 Endsleigh Street, London WC1H 0DD, <http://www.eldis.org/id21ext/s7cjh1g1.html>
- Richard M. L, Fei Qin and Brause (2007). "Does Monitoring Improve Labour Standards? Lessons from Nike", *Industrial and Labour Relations Review*, Volume 1, p. 61, October, 2007, <http://web.mit.edu/polisci/research>, viewed on 02/04/2010

Richard, P. and Cong Cao (2007). "CHINA: Science and Technology Power is Emerging", *Oxford Analytical Daily Brie*, Oxford, UK: Oxford Analytica (April 19).

Turner, L. (1991). "Democracy at Work: Changing World Markets and the Future of Labour Unions", pp. 128-135, Ithaca and London: Cornell University Press, <http://books.google.com.au/books?>

Appendix A

Nike Code of Conduct

Nike, Inc was founded on a Handshake

Implicit in that act was the determination that we would build our business with all of our partners based on trust, teamwork, honesty and mutual respect. We expect all of our business partners to operate on the same principles.

At the core of the NIKE, corporate ethic is the belief that we are a company comprised of many different kinds of people, appreciating individual diversity, and dedicated to equal opportunity for each individual.

NIKE designs, manufactures and markets products for sports and fitness consumers. At every step in that process, we are driven to do not only what law requires, but also what is expected of a leader. We expect our business partners to do the same. NIKE collaborates with contractors who share our commitment to best practices and continuous improvement in:

1. Management practices that respect the rights of all employees, including the right to free association and collective bargaining
2. Minimizing our impact on the environment
3. Providing a safe and healthy work place
4. Promoting the health and well-being of all employees

Contractors must recognize the dignity of each employee, and the right to a work place free of harassment, abuse or corporal punishment. Decisions on hiring, salary, benefits, advancement, termination or retirement solely based on the employee's ability to do the job. There shall be no discrimination based on race, creed, gender, marital or maternity status, religious or political beliefs, age or sexual orientation.

Wherever NIKE operates around the globe, this Code of Conduct guides us and we bind our contractors to these principles. Contractors must post this Code in all major workspaces, translated into the language of the employee, and train employees on their rights and obligations as defined by this Code and applicable local laws. While these principles establish the spirit of our partnerships, we also bind our partners to specific standards of conduct. The core standards are set forth below.

Forced Labour

The contractor does not use forced Labour in any form-prison, indentured, bonded or otherwise.

Child Labour

The contractor does not employ any person below the age of 18 to produce footwear. The contractor does not employ any person below the age of 16 to produce apparel, accessories or equipment. If at the time Nike production begins, the contractor employs people of the legal working age who are at least 15, that employment may continue, but the contractor will not hire any person going forward who is younger than the Nike or legal age limit, whichever is higher. Further, ensure these age standards are complied with, the contractor does not use any form of homework for Nike production.

Compensation

The contractor provides each employee at least the minimum wage, or the prevailing industry wage, whichever is higher; provides each employee a clear, written accounting for every pay period; and does not deduct from employee pay for disciplinary infractions.

Benefits

The contractor provides each employee all legally mandated benefits.

Hours of Work and Overtime

The contractor complies with legally mandated work hours while employee uses for overtime is fully compensated according to local law. Informs each employee at the time of hiring if mandatory overtime is a condition of employment; and on a regularly scheduled basis provides one day off in seven, and requires no more than 60 hours of work per week on a regularly scheduled basis, or complies with local limits if they are lower.

Environment, Safety and Health (ES&H)

The contractor have written environmental, safety and health policies and standards, and implements a system to minimize negative effects on the environment, reduce work-related injury and illness, and promote the general health of employees.

Documentation and Inspection

The contractor maintains on file all documentation needed to demonstrate compliance with this Code of Conduct and required laws; agrees to make these documents available for Nike or its designated monitor; and agrees to submit to inspections with or without prior notice.

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INTERCULTURAL BUSINESS COMMUNICATION: AN ANALYSIS OF ETHNOCENTRISM IN A GLOBALIZED BUSINESS ENVIRONMENT

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ABSTRACT

Twenty-first century organizations, rather small, medium, or large are increasingly finding themselves competing in global rather than local markets. This paper explores the current literature on the increasing global influence of ethnocentrism and its affect on international business communication. It also provides a model for overcoming ethnocentrism in a multicultural business environment. The goal of the paper is to provide practitioners with a realistic approach for overcoming ethnocentrism in a multicultural workplace.

Key Words :

Ethnocentrism; Globalization; Intercultural Business Communication

INTRODUCTION

Twenty-first century organizations have become increasing aware of the major benefits and broader perspectives that globalization creates in the domestic and international marketplace. Globalization is the capability of a corporation to market a product to the entire civilized world (Chaney & Martin, 2007). Bowes (2008) defines globalization as a means of creating a multicultural work force through welcoming new employees from various countries into their workplaces. According to the 2007 U.S. Census bureau, by the middle of the twenty-first century, the United States will cease to have a majority race. Non-Hispanic whites will comprise about one-half of the total population, while Hispanics will account for about one-quarter of this country's population. African Americans will grow to about 13 percent, while Asian Americans are projected to become about 8 percent of the nation's citizenship. Out of more than 278 million people living in the U.S., over 33 million speak Spanish; while more than 10 million speak another European language and more than 8 million speak an Asian language.

Globalization brings about significant international competitive advantages. A diverse workforce can yield a significant competitive advantage by employing new ideas and communication skills (Bovee & Thill, 2010). It can also provide a diversity of thought that result in better business solutions (Gupta, 2008). Here, the author explains why companies are embracing diversity and argues that embracing diversity is a positive motivational tool that can attract and retain the best employees, as well as achieving a better level of competitiveness. However, with these benefits come challenges. As Bovee & Thill (2010) and Ferraro (2001) noted, to be effective in interacting across cultural boundaries, organizations need to be sensitized to the values of understanding, appreciating, and respecting human and cultural differences.

Organizations face the challenge of coexisting with business partners and the community, while managers and supervisors face the challenge of motivating and creating harmony among their workers. For example, Earley (1997) noted that Chinese business etiquette is most reserved and unlike the United States. To the United States businessperson, a personal relationship can be separated from business. Friendships are formed quickly and dissolved. Hence, ethnocentrism may lead China businesspersons to view the U.S. business relationship as insensitive and shallow (Martin & Chaney, 2006). Similarly, Teagarden (2008) argues that traditional views of opportunities must move beyond market opportunities to people who populate those markets and

create the potential for opportunity. The author further explains that organizations must incorporate the human face of diverse cultures as they develop and execute global business strategies. Ruch (1989) agrees, noting that as a result of the rise of the internationalized business environment, the managing of human diversity has become a daily task for a major part of the business community. The authors stress that in this globalized business environment, organizations ability to unify with other cultures is more important than product, price, or quality advantages. Unification however, can prove to be difficult because of the presence of ethnocentrism.

Sumner (1906) coined the word “ethnocentrism” as “this view of things in which one’s own group is the center of everything, and all others are scaled and rated with reference to it... Each group nourishes its own pride and vanity, boasts itself superior, exalts its own divinities, and looks with contempt on outsiders. Each group thinks its own folkways as the only right ones, and if it observes that other groups have other folkways, these excite its scorn” (p. 13). Bennett (2008) describes ethnocentrism as an attitude or mindset conceived in three stages: (1) the denial stage, (2) the defense stage, and (3) the minimization stage. People in the denial stage are completely ethnocentric and do not recognize the existence of cultural differences. Those in the defense stage recognize the existence of other cultures, but not their validity. People in the minimization stage of ethnocentrism try to minimize other cultures by telling themselves that people are more similar than dissimilar. Hence, it is easy to understand how these attitudes can lead to breakdowns in effective intercultural communication. For purposes of this research, intercultural business communication is defined as communication within and between businesses that involves people from more than one culture (Chaney & Martin, 2007).

For instance, Hilton & Kameda (1999) argue that ethnocentrism left unchecked, can lead to great misunderstanding in intercultural business communication. Flatley, Rentz and Lentz (2012) note that it is crucial that the business communicator is able to adapt to quickly changing responsibilities and work relationships. Increased globalization of business, immigration, the aging of the “Baby Boomers,” the escalation of women in the workforce, and the changing educational environment are all fueling these trends. Fisher (1997) defines ethnocentrism as a mindset that believes that your own cultural background is the central culture and that other cultures are incorrect or defective. The author notes the importance for individuals to build a sense of identity and self-esteem, but points out that people sometimes develop the mistaken belief that others are not as good as they are. For example, Tung & Miller (1990) suggest that American managers and executives prove to be consistently ethnocentric in their approach to management including the development and implementation of policies, practices, and procedures. The authors point out that many American corporations do not integrate an international perspective in their management agenda.

Hence, this article begins with a review of the current literature exploring ethnocentrism in a globalized business environment. The literature review is followed by a discussion of the research methodology and the development and administration of the research tool, followed by a discussion of the finding. In the final section, the conclusions are summarized and implications for overcoming ethnocentrism posited.

LITERATURE REVIEW

This review examines ethnocentrism from two different but related perspectives: communication and culture. Culture is the structure through which communication is formulated and when cultures interact, knowing all the cultural factors that affect the situation is essential (Chaney & Martin, 2007). Communication, both intercultural and international is necessary for upward mobility in tomorrow’s corporate world (Martin & Chaney, 2006).

Ethnocentrism and Communication

A number of studies (Moon & Wooliams, 2000; and Victor, 1992) emphasize the pervasiveness of ethnocentrism on effective international business communication. The authors explain that

ethnocentrism is deceptive precisely because members of any culture view their own behavior as correct. For example, since no one individual is likely to recognize the different forms of ethnocentrism within themselves, business communicators must be especially careful when conducting business across cultures. That is, businesspersons need to understand how the perception of a message changes depending on the cultural context of the business situation. Victor (1992) argues that the difficulties of communicating at a global level have become increasingly difficult because of the lack of understanding deriving from ethnocentrism or ignorance of culturally based assumptions. Different types of people tend to have different ways of expressing themselves. For example, formal cultures place a high emphasis on following business communication protocol and social customs, while informal cultures, notably the United States, dispense with ceremony and are more casual in the workplace, and thus the level of directness and explicitness that individuals display in their communication is determined largely by their particular culture.

Grimes & Richard (2003) describe ethnocentric communication as interactions between natives and non-natives. Natives are people considered by the communicator as part of their own group, that is, those they understand, and thus they are able to communicate with their own group without any discomfort because their assumptions are not challenged. Here, the authors emphasize that even though natives see themselves as the dominant group, both dominant and non-dominant groups may be ethnocentric communicators. The difference being that the non-dominant groups do not control such institutions as the media, the legal system, or business, thus their ethnocentrism does not have the same power as the ethnocentrism of dominant groups. For example, Peltokorpi (2007) asserts that ethnocentric recruitment and language policies are expected to have a negative impact on international employee relationships and business communication. Similarly, Harzing and Feely (2008) argue that inadequate host country language skills and possible categorization of non-dominant group members can make important information inaccessible and foster feeling of rejection and psychological distress.

In efforts to overcome such negative feeling, Chen and Starosta (2004) explain that there must be a level of intercultural sensitivity that serves as a prerequisite for intercultural communication competence. The kind of competence meant here is an ability to accomplish goals while also reducing misunderstandings and building strong interpersonal, cross-cultural relationships (Cheesebro, O'Connor & Rios, 2010.) As one's intercultural communication sensitivity increases, so do one's level of intercultural communication competence. Intercultural communication sensitivity is related to cognitive, affective and behavioral aspects of our interactions with others and focuses on concepts such as managing and regulation emotions.

Ethnocentrism and Culture

Chaney and Martin (2007) note that whereas communication is a process, culture is the structure through which the communication is formulated and interpreted, and both ethnocentrism and culture have been cited as the cause of serious communication problems in the world. Lin, Rancer, and Trimbitas (2005) found that Romanian students were more ethnocentric than American students. Here, the authors proposed that these results may result from Romania's history of unrest and polarization. Similarly, Neuliep, Chaudoir, and McCroskey (2001) postulate that because of found differences on a socialization scale between Japanese students and their American counterparts. They noted that Japanese thinking and homogenous culture may account for these results. In addition, in both studies, men scored higher than women (Lin et al., 2005), suggesting that socialization accounts for this difference (Neuliep et al., 2001).

The anthropologist Edward Hall (1959) defined culture as an unseen powerful force. He states, "Culture is not an exotic notion studied by a select group of anthropologists in the South Seas. It is a mold in which we all are cast, and it controls our lives in many unsuspected ways" (p. 52). Chaney and Martin (2007) argue that many times, ethnocentric communication does not account for cultural differences in the workforce. For example, U.S. cars were not selling in Japan because of the U.S. car manufacturer's lack of effective intercultural communication. These

manufacturers failed to change the position of the steering wheel from the left to the right for driving on the opposite side of the road from the United States.

METHOD

The study utilizes a qualitative research method by employing Orbe' (1998) theory of co-cultural communication as a conceptual framework to analyzing the current literature on ethnocentrism in today's international business environment.

Orbe's Model of Co-Cultural

The main purpose of this study is to provide communication practitioners with a template for overcoming ethnocentrism in today's multicultural organizations. To accomplish this task, this study will utilize Orbe's (1998) Model of General Orientations of Co-cultural Communication that occurs during intercultural relationships, as a guide and map to analyzing and overcoming ethnocentrism in the organization.

As you can see from the Table 1 below, Orbe has identified three general orientations that occur during co-cultural communication. These orientations are labeled nonassertive, assertive, and aggressive and within each orientation, communicators may emphasize modes of assimilation, accommodation, or separation in relation to the dominant group. The goal of this process is to determine which, if any strategy is the most effective in overcoming ethnocentrism in a globalized business environment. Thus, the discussion section of this paper focuses on accommodation theory, assimilation theory, and separation theory, and how each of these theories lend themselves to overcoming the pervasiveness of ethnocentrism in a globalized business environment.

Table 1
Types of Separation, Accommodation, and Assimilation Strategies

	Separation	Accommodation	Assimilation
Nonassertive	<ul style="list-style-type: none"> - Avoiding - Maintaining interpersonal barriers 	<ul style="list-style-type: none"> - Increasing visibility - Dispelling stereotypes 	<ul style="list-style-type: none"> - Emphasizing commonalities - Developing positive face
Assertive	<ul style="list-style-type: none"> - Communicating self - Embracing stereotypes 	<ul style="list-style-type: none"> - Communicating self - Using liaisons - Educating others 	<ul style="list-style-type: none"> - Extensive preparation - Over compensating
Aggressive	<ul style="list-style-type: none"> - Attacking - Sabotaging others 	<ul style="list-style-type: none"> - Confronting - Gaining advantage 	<ul style="list-style-type: none"> - Disassociating - Mirroring - Strategic distancing

Source: M. Orbe, 1998.

DISCUSSION

Overcoming Ethnocentrism: Accommodation Theory

Overcoming ethnocentrism under the framework of accommodation offers several insights. Businesspeople understand that ethnocentrism is a principle barrier for achieving intercultural accommodation. Initially proposed by J. Piaget, the term accommodation refers to the process of altering one's existing schemas, or ideas, as a result of new information or new experiences (Piaget, 1977). For example, when a young person moves away to college, they suddenly find themselves surrounded by people from a foreign group that causes that person to act ethnocentrically. However, through experience and real interactions with members of that group, they realize that their existing knowledge of the group was incorrect, thus overcoming the fears leading to ethnocentrism. Huang (2012) noted that respecting other cultures through accommodation must become a fundamental attitude in business transactions.

Chaney and Martin (2007) argue that with an increased recognition of differences as well as similarities, businesspersons can adjust their mode of communication to fit the individual culture with which they are communicating. For example, communication accommodation theory developed by Giles (1991) argues that when people interact they adjust their communication patterns and strategies to accommodate others. Communication accommodation theory aids in overcoming ethnocentrism by utilizing two main accommodation processes described by the theory, which are convergence and divergence.

Several studies (Gibbons, 2005 & Giles, 2007) refer to convergence as strategies through which individuals adapt to each other's communicative behaviors, in order to reduce their social differences, while divergence refers to the instance in which individuals accentuate the speech and non-verbal differences between themselves and those to which they communicate. According to Giles and Coupland (1991), convergence reflects an individual's desire for social approval, and that the greater the individual's need for social approval, the more likely he or she is to converge. Here, the author notes that converging increases the effectiveness of communication, which in turn lowers uncertainty, interpersonal anxiety, and increase mutual understanding, all of which are factors in the reduction of ethnocentrism. Similarly, divergence reflects a desire to communicate in a positive manner by emphasizing group distinctiveness and maintaining cultural identities. Here, accommodation of circumstances is viewed as taking place quickly, where the person or group is typically highly conscious of the process of accommodating. By contrast, this paper now turns to assimilation theory in its quest for an answer to overcoming ethnocentrism. Rumbaut (1997) describes the process of assimilation as more subtle and gradual than accommodation, and is typically unconscious. The author further explains that it is through communication that gradual and unconscious changes of attitudes and sentiments are produced, and thus a common language between groups of people fostering ethnocentric attitudes is indispensable in the process of assimilation.

Overcoming Ethnocentrism: Assimilation Theory

Hao (2010) characterizes assimilation by four features: (1) inevitability, (2) full incorporation, (3) a lack of a positive ethnic group role and (4) the most objectionable, ethnocentrism. The author explains that this approach has become increasingly inadequate since the United States entered into a new era of globalization. This theory sees other cultures as valueless and immigrants as giving up their culture if they are to assimilate. Similarly, Alba and Nee (2003) conclude that assimilation is a contested idea today. Here, the authors stresses that since the 1960's, assimilation has been seen in a mostly negative light, and has an ethnocentric and patronizing imposition on minority peoples struggling to retain their cultural and ethnic integrity. Rumbaut (1997) asserts that while assimilation was once often thought of as good and uncritically received, a compelling body of evidence describes assimilation as producing deteriorating outcomes and exposing ethnocentric pretensions over time and generation in the United States. There exists a

certain pressure to adopt the language, customs, and behavior that were seen as the norm in order to gain acceptance. As the author emphasizes, these pressures produce patronizing ethnocentrism with built in assumptions about adjustments that equates “foreign” with “inferior”.

Vyrgo (2011) notes that complete assimilation requires a person or group of people to barter away his/her past for a future, however, without that past the person cannot remain whole. For example, the African American, although, apparently not Anglo-American, has assimilated into the American society and culture. They were brought to this country in chains and disassociated from their culture by force. In order to survive, the black American had to fully assimilate into the American culture and adopt the customs and ways of the dominant society. The author further observes that assimilation for the African American was a slow process, based on ethnocentrism and caused by America’s bias against the “other”. The need for survival and fear of the dominant culture forced the African American to attempt assimilation; however, white America did not believe that the “inferior” black race should or could ever become as “civilized” as they. Hence, assimilation into society occurred long after the African American had fully acculturated.

However, the last two decades have seen significant changes in cultural values which have led to emerging schools of thought on how to manage people and organizations in a globally competitive business environment (Amaran, 2007). According to the author, the traditional approach to handling issues related to multiculturalism in complex organizations has changed for three reasons: (1) a quest for social justice, (2) legal obligations arising from civil rights laws, and (3) the limitations of affirmative action which have led to calls for new proposals. The author states, “the strategic imperatives imposed on American businesses for competitive advantage in the global marketplace, have created more pressures to acknowledge and deal with cultural diversity in a way that recognizes and works with differences in cultures without denigrating or submerging some under others” (p. 2). As such, these changes offer insights into overcoming ethnocentrism, thus creating both opportunities and challenges in a globalized business environment.

Overcoming Ethnocentrism: Separation Theory

Unlike assimilation and accommodation, separation offers little hope in forming a common bond with other overcoming ethnocentrism. Those embracing this stance seek specific, separate group identities that will withstand the assimilation process (Parrillo, 1996), and believe that it is futile to try to work within different ethnic groups (Golden & Rieke, 1971).

CONCLUSION

Globalization of businesses and markets brings about significant international competitive advantage for organizations. Bovee and Thill (2010) stressed that a diverse workforce can yield a significant competitive advantage by employing new ideas and communication skills. Similarly, Gupta states that it provides a diversity of thought that result in better business practices and relationships. The authors agree on the importance of companies embracing diversity because diversity brings a positive motivational tool that can attract and retain the best employees, as well as achieving a better level of competitiveness for organizations. Finally, Bovee & Thill (2010) and Ferraro (2001) noted that to be effective in interacting across cultural boundaries, managers need to be sensitized to the values of understanding and appreciating cultural differences in their organizations.

REFERENCES

- Alba, R. & Nee, V. (2003). *Remaking the American mainstream: Assimilation and contemporary immigration*. Cambridge, MA: Harvard University Press.
- Amaram, D. (2007). *Cultural diversity: Implications for workplace management*. *Journal of Diversity Management*, 2(4), 1- 6.
- Bennett, M. (1998). *Basic concepts of intercultural communication*. Boston: Intercultural Press, Inc.
- Bovee, C. L., & Thill, J. V. (2010). *Business communication today* (10th ed.). Boston: Prentice Hall.
- Bowes, B... (2007, December). The business case for workplace diversity. *CMA Management*, 81(8), 14-16. Retrieved June 24, 2011, from ABI/INFORM Global. (Document ID: 1430001721).
- Chaney, L.H. and Martin, J.S. (2007). *Intercultural business communication* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Chen, G. M. & Starosta, W.J. (2004). Communication among cultural diversities: A Dialogue. *International and Intercultural Communication Annual*, 27, 3-16.
- Cheesebro, T., O'Connor, L., and Rios, F. (2010). *Communicating in the workplace* Upper Saddle River, N.J.: Prentice Hall.
- Early, P.C. (1997). *Face, harmony, and social structure: An analysis of organizational behavior across cultures*. New York: Oxford University Press.
- Ferraro, G. P. (2001). *Global brains: Knowledge and competencies for the twenty-first century*. NC: Intercultural Associates, Inc.
- Giles, H. & Coupland, N. (1991). Accommodation theory: Communication, context, and consequence. *Contexts of accommodation*. New York: Cambridge University Press.
- Giles, H. (2007). Communication accommodation theory. In Whaley, Bryan B.; Samter, Wendy. Mahwah, N.J: Lawrence Erlbaum.
- Gupta, S... (2008, October). Mine the Potential Of Multicultural Teams. *HR Magazine*, 53(10), 79-80, 82, 84.
- Fisher, G. (1997). *Mindsets* (2nd ed.) Yarmouth, ME: Intercultural Press.
- Flatley, M., Rentz, K., & Lentz, P. (2012). *Business communication* (2nd ed.) New York: McGraw-Hill.
- Gibbons, J. (2005). Book Review: Law enforcement, communication and community. *Journal of Multilingual and Multicultural Development* 26 (3), 265-267.
- Golden, J. C., & Rieke, R. D. (1971). *The rhetoric of Black Americans*. Columbus, OH: Merrill.
- Grimes, D. & Richard, O. (2003). Could communication form impact organizations' experience with diversity? *Journal of Business Communication*, 49(1), 7 – 27.
- Hall, E. T. (1959). *The silent language*. Greenwich, CT: Fawcett Publications.
- Harzing, S., & Feely, A. J. (2008). The language barrier and its implications for HQ-subsidiary relationships. *Cross cultural management*, (15), 49 – 61.
- Hilton, C. & Kameda, N. (1999). Email and the internet as international business communication teaching and research tools: A case study. *Journal of Education for business*, 35(4), 181-185.
- Hoa, L. (2010). *Color lines, country lines: Race, immigration, and wealth stratification in America*. New York: Russell Sage Foundation.

- Huang, Geng G. (2012). Overcoming ethnocentrism. Retrieved March 9, 2012 from:<http://ccomm.bravehost.com/Report2.html>.
- Lin, Y., Rancer, A. S. & Trimbitas, O. (2005). Ethnocentrism and intercultural-willingness-to-communicate: A cross-cultural comparison between Romanian and US American college students. *Journal of Intercultural Communication*, 34, 138-151.
- Martin J.S. & Chaney, L.H. (2006). *Global business etiquette: a guide to international communication and customs*. Westport, Conn: Praeger Publishers.
- Moon, C. J. & Wooliams, P. (2000). Managing cross-cultural business ethics. *Journal of business ethics*, (9), 14 – 17.
- Neuliep, J.W., Chadoir, M., & McCroskey, J.C. (2001). A cross-cultural comparison of ethnocentrism among Japanese and United States college students. *Communication Research Reports*, 18(2), 137-146.
- Orbe, M. (1998). *Constructing co cultural theory: An Explication of culture, power, and communication*. Thousand Oaks, NJ: Sage Publications.
- Parrillo, V. N. (1996). *Diversity in America*. Thousand Oaks, CA: Pine Forge Press.
- Peltokorpi, V. (2007) Intercultural communication patterns and tactics: Nordic expatriates in Japan. *International Business Review*, (16), 68 – 82.
- Piaget, J. (1977). Gruber, H.E.; Voneche, J.J. eds. *The essential Piaget*. New York: Basic Books.
- Rumbaut, R. G. (1997). Assimilation and its discontents: Between rhetoric and reality. *International Migration Review*, Vol. 31, No. 4, Special Issue: Immigrant Adaptation and Native-Born Responses in the Making of Americans, pp. 923-960.
- Ruch, W.V. (1989). *International handbook of corporate communication*. Jefferson: McFarland.
- Sumner, W.G. (1906). *Folkways*. Boston: Ginn.
- Teagarden, M.B. (2008) Emerging market competition in a globalizing world. *Thunderbird International Business Review*, 50(3), 143-144.
- Tung, R.L. & Miller, E.L. (1990). Managing in the twenty-first century: The need for global Orientation. *Management International Review*, 30(1), 5-18.
- U.S. Census Bureau (2007), “National Population Projection (Summary Files),” available online at <http://www.census.gov/population/www/projections/natsum-T1.html>.
- Vyrgo, L. (2011). “Assimilation versus acculturation”, available online at <http://ly9234eva.tripod.com/lybravyrgo/id32.html>.
- Victor, D. (1992). *International business communication*. New York: Harper Collins.

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Research on the Relationship between University-industry Collaboration Networks and Innovation Performance at Firm Level based on Complex Network Analysis

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[Abstract] In this paper, we firstly investigate multiplicative interaction between clustering and reach as well as their effect on members' knowledge creation and patent value based on complex network analysis in Nanobio pharmaceuticals, an emerging and rapidly evolving field. This study broadens this to university-industry collaboration networks in the emerging interdisciplinary field at firm-level. Furthermore, we build network to detect the impact of small world properties as well as the size of largest component on patent value of innovation performance at firm level. We do find that small-world structure has parabolical effect on patent value of innovation at firm-level. We add new evidence to the literature on this topic with an empirical investigation for the university-industry patent collaboration in nanobio pharmaceutical field. Given that the high skew of patent value among patents, we use weighted patent value as a measure of the invention's innovation performance rather than simple patent counts. The findings broaden and enrich the existing literature and can contribute to policy makers and relevant managers when making decisions for university and firm locality as well as the choices of the collaborators.

[Keywords] Nanobiopharmaceuticals; university-industry collaboration; S-curve models; small world networks

1 Introduction

In today's highly competitive environment, a firm's ability to catch up with technological progress and continuously innovate is crucial for its survival and growth. However, it is increasingly difficult for firms to explore new technologies completely on their own as a result of limited expertise and resources. There has been a universal recognition that collaboration between industry and research universities should be enhanced in order to satisfy the growing demand for industrial innovation in the global market place. The linkages among universities and industry comprise significant parts of regional as well as national innovation systems^[1]. Therefore, enhanced collaboration between them is crucial for the competitiveness of a country. University-industry knowledge transfer is nowadays a key research subject both in economics and management studies, as well as a top entry in the science and technology policy agenda of a number of developed and developing countries^[2].

It has been certified that collaboration between industry and universities is useful in reducing the cost of R&D, decentralizing risks, and promoting these organizations to share resources and attain complementary capability^[3]. Such cooperation has become increasingly crucial to the success of industrial innovation for most countries. For example, Canadian industry doubled its collaboration with universities from 1980 to 1995^[4]. The modes of innovative cooperation between industry and universities are largely of informal communication of skills and knowledge, technology trade or technology transfer, formal R&D collaboration (e.g., R&D alliance, R&D outsourcing), training of innovative personnel, and provision of skilled workforce and graduates with knowledge and skills and so on^[5].

Furthermore, social network analysis (SNA) is a hopeful method for comprehending the complex relations between various actors, such as industry and universities, inventors within

organizations, organizations with regions, and so forth^[6]. It can be utilized for discriminating the structures in social systems according to the relations among the system's components rather than the attributes of individual cases^[7]. Networking can be a complementary factor in situations where cooperation and networking are required to attain economies of scale and/or to integrate diverse skills, technologies and competencies^[8]. To our knowledge, there are several empirical researches have examined the impact of the collaboration network characteristic on knowledge creation. Some researchers suggested that network cooperation or using a wide range of external actors and sources had a positive influence on innovation performance of firms^[9]. Becker and Dietz^[10] explicitly acknowledged that cooperation with different partners on research and development (R&D) had a positive effect on innovation achievement. Similarly, Brioschi et al.^[9] noticed that social interactions based on trust and cooperation took a major role in coordination of the activities among different small- and medium-sized enterprises (SMEs). Uzzi and Spiro [11] pondered the network structure of the creative artists who made Broadway Musicals from 1945 to 1989, and inferred a conclusion that the large-scale structure of the artists' collaboration network notably affected on their creativity, and the financial and artistic performance of their musicals. Schilling and Phelps^[12] worked over the impact of large-scale network properties on the innovative output of members of the network. Chen and Guan^[13] investigated the impact of small world properties on innovation at national level with an empirical investigation for the patent collaboration networks of 16 main innovative countries during 1975–2006. Despite the recognized importance of university-industry collaboration across various S&T fields, relatively few studies^[14-16] have examined the impact of network topologies of the university-industry collaboration on member innovation, especially in interdisciplinary field. As for interdisciplinary field, of which we just spoke, in this article, nanobiopharmaceutical technology, as an emerging and rapidly evolving field with the interdisciplinary nature, is chosen. Nanobiopharmaceutical technology connotes the technology which can be used in production or consumption for applications of nano and biotech drug discovery^[17]. This field is chosen for three reasons. First, carefully checking nanotechnology research demonstrates a large increase in research activity in nanobiopharmaceutical field since 2000. Since 2000, we have enjoyed a profusion of success producing bionano research findings while taking the fancy of a great deal of investment from pharmaceutical corporations setting up advanced drug discovery operations. This field is a promising research domain from latest scientific advances with potential and enormous economic value. Nanobiopharmaceuticals is emerging from recent scientific advances to which marketers and investors attribute enormous commercial potential. Second, nanobiopharmaceuticals is a generic and radical technology that is of high interest owing to its potential for value creation across an extensive range of industries and applications. As a generic technology, nanobiopharmaceuticals offers the potential for value creation across a broad range of industries and applications, which will get access to benefits for a wide range of sectors of the economy and/or society^[18]. Recently, many areas of nanobiopharmaceuticals have witnessed a speedy increase in the number of patents filed^[19]. Therefore, we are interested in development and application of bionanotechnology within the domain of pharmaceutical research. Third, it is widely acknowledged that nanobiopharmaceuticals, as an emerging and rapidly evolving field with the multidisciplinary nature, is perceived not only by scientist and technology developers but also by policy-makers as one of crucial technologies of this century. New interdisciplinary research areas often develop in the interstices of established fields, through fusion or integration of some topics across the existing parent fields^[20]. It has great prospect to lead the world into next new industrial revolution. Little is implemented bibliometric analyses, however, about nanobiopharmaceuticals. Lenoir and Herron^[17] combine citation analysis, text mining, mapping, and data visualization to gauge the development and application of nanotechnology in China, particularly in nanobiopharmaceuticals, and to estimate the impact of Chinese policy on nanotechnology research production. Zhao and Guan^[21] studied the International collaboration of three 'giants' with the G7 countries in emerging nanobiopharmaceuticals. Preceding argument brings about the following questions: how does the structure of a university-industry collaboration network in the field of nanobiopharmaceuticals influence the rate of knowledge creation among firms and universities in the network?

In particular, the network method provides a systematic analytical tool to uncover the hidden structure and to monitor the effectiveness of knowledge exchange among researchers across industry and university. The goals of the paper are two-fold: first, we study the impact of following two key network properties, clustering and reach, on the innovative output of members of the network. Second, we generate network to detect the impact of small world properties as well as the size of largest component on patent value of innovation performance at firm level. This study broadens the existing literature in several ways. First, one of the challenges with using patents to measure innovation is that the propensity to patent may vary with industry, resulting in a potential source of bias. Previous quantitative studies have merely emphasized the patent counts yet have considered little about the difference of patent value. We use weighted patent value (WPV) as a measure of the invention's innovation performance rather than simple patent counts. Second, Schilling and Phelps^[12] proposed that firms embedded in alliance networks that exhibited both high clustering and high reach (short average path lengths to a wide range of firms) will have greater innovative output than firms in networks that do not exhibit these characteristics. They find support for this proposition in a longitudinal study of the patent performance of 1,106 firms in 11 industry-level alliance networks. We broaden this proposition to firm-level university-industry collaboration networks in an emerging interdisciplinary field other than only alliances between firms. Third, Despite the several empirical studies of small world network and innovation at national, industrial, discipline or regional level^[12-13; 22-23], in this study, we develop and exploit a novel database on university-industry patent collaboration for the field of nanobiopharmaceuticals to investigate the impacts of small world networks on the patent value of innovation output at firm-level. Fourth, the study is relevant, as nanobiopharmaceuticals is quite a new technology and there are not many works that analyze this field under a quantitative approach. The remaining parts of the paper are organized as follows. The next section discusses that the impact of clustering and reach on Weighted Patent Value (WPV) of the innovative output of members, and develops the hypotheses to be tested. The third section discusses the impact of small worlds on WPV of the innovative output of members, and develops the hypotheses to be tested. The fourth section presents our data, methods for network generation, variables, small world measures and model specification. The fifth section presents the results of the empirical analysis, whose main implications are discussed in the last section.

2 The impact of clustering and reach on WPV of the innovative output

Clustering

The Clustering Coefficient (CC) is a measure of the local graph structure. Co-authorship networks are liable to be characterized by local clusters of individuals who are tied to most of the others^[24]. The actual CC is on a scale from zero to one. Zero stands for no clustering, and one stands for full clustering. For example, it is the probability of co-operation if both have worked together a third author for coauthor networks. If a network has a clustering coefficient of 0.6, it signifies that there is 60% of a probability that two authors both collaborating with a third author would also work together each other. Clustering enhances the information transmission capacity of a network.

Reach

The size of a network and its average path length (i.e., the average number of links that separates each pair of members in the network) also influences information diffusion and novel recombination. A member's distance-weighted reach is the sum of the reciprocal distances to every member that is reachable from a given member, i.e., $\sum_j 1/d_{mj}$, where d_{mj} is defined as the minimum distance (geodesic), d , from a focal member m to partner j , where $m \neq j$. A network's average distance-weighted reach is this gauge averaged across all members in the network, $(\sum_n \sum_j 1/d_{mj})/n$, where n is the number of member in the network using distance-weighted

reach. It provides a significant gauge of the overall size and connectivity of a network, even when that network has manifold components, and/or component structure is changing over time.

Recent research has revealed that even sparse, highly clustered networks can have high reach if there are a few links generating bridges between clusters ^[25-26]. As Uzzi and Spiro noticed, bridges between clusters increase the likelihood that different ideas and routines will come into contact, facilitating recombinations that integrate both previous conventions and novel approaches while reducing the average path length and increasing reach^[11]. The combination of clustering and reach enables an extensive range of information to be interchanged and integrated rapidly, bringing about greater knowledge creation ^[12]. In sum, we forecast a multiplicative interaction between clustering and reach in their impact on member knowledge creation. Consistent with the symmetrical nature of such interactions ^[27], we have argued and anticipate that the effect of clustering on members' knowledge creation and patent value will be increasingly positive as reach increases, while the effect of reach on patent value will be more and more positive as clustering increases.

Hypothesis 1. Members going in for alliance networks that combine a high degree of clustering and reach will exhibit more patent value than members in networks without these characteristics.

3 The impact of small worlds on WPV of the innovative output of members

In today's highly competitive society, a firm's performance relies on how it can acquire resources within a network of relationships ^[28]. Strategic research has been made to study how network topology molds the evolution of competition in various industries ^[29]. One type of social organization that has obtained a great deal of attention for its possible ability to impact creativity and performance is the small world network.

We focus our study at the firm level, allowing us to explore the relationship between small world collaboration network and WPV of the innovation output. It is argued that small worlds can enhance the level of creativity and innovation. The effects can be organized into three aspects, clustering, path length and their interaction. When the clustering increases, the more connected and cohesive nature should cultivate innovation through the sharing of ideas, soft information and other resources. Besides the more easy diffusion of creative material, the greater level of repeated and third party links can also bring about greater risk sharing and trust in a community ^[30]. High clustering facilitates sanctions that make it less risky for people in the network to trust one another. Over the long haul, repetitive ties can reduce innovation cost by spreading the risk of experimentation. Both the effects on creative material diffusion and trust enhancement reveal that increased clustering can enhance the performance of the global network. While on the other side, high clustering may bring about too much common perspectives and unnecessary information, which may harm innovation performance because inventors need to think differently in order to break existing prototypes. As Uzzi and Spiro ^[11] point that, small world's effect may be parabolic. As the level of small world adds, separate clusters change into more interlinked and linked by persons who understand each other. These processes contribute creative material among teams and help to establish a cohesive social organization within teams that encourage risky collaboration around good ideas. However, these benefits may rise only up to a marginal value after which point they shift negative ^[31]. Past a certain threshold, these same processes can be a hindrance for collaboration. Excessive structural connectivity decreases some of the creative distinctiveness of clusters, which can make similar pool of creative material. The ideas most probably to flow can be traditional rather than fresh opinions due to the common information effect and because newcomers discover it difficult to land "slots" on productions.

How can these opposing points of view work together? We put forward that when the clustering is at a relative low level, there are few links between friends of friends and the global networks do not get necessary information, so increasing clustering should enhance innovation performance because it brings more effective creative material diffusion and risk sharing. However, past a certain threshold, the positive aspect becomes neglectable while negative aspect begins to work noticeably to whittle down the innovation output.

These drivers all give rise to the expectation of a parabolic relationship between network clustering coefficient and WPV of innovation performance. Hence, our second hypothesis is:

Hypothesis 2. The relationship between network clustering coefficient and WPV is parabolical. Specially, below a medium level, clustering coefficient will correlate positively with increased future WPV, while the correlation will turn negatively when overtaking the medium level.

Independent of the medium clustering coefficient, the shorter path length should also enhance inventor's innovation performance for its ability of easier information transfer, diverse ideas interaction and heterogeneous creative resource diffusion^[23].

We anticipate a positive relationship between decreased path length and WPV of innovation performance. Thus we come to our third hypothesis:

Hypothesis 3. Decreased average path length of the university-industry collaboration network will have a positive effect on the future WPV for its member.

As discussed above, we suggest that higher clustering can bring more positive effect when it is under the threshold and more negative effect when the threshold is overtaken, while shorter path length always has positive effects, thus it is rational to put forward another parabolic relationship between small world Quotient and WPV of innovation output. Thus we come to our fourth hypothesis:

Hypothesis 4. The relationship between small world Quotient and WPV of innovation performance is parabolical. Specially, below a medium level, small world Quotient will correlate positively with increased future WPV, while the correlation will turn negatively when overtaking the medium level.

In this study, we discover that at the beginning of the network evolution, the global networks are made up of numerous small components, and then collaborations among these components connect them together to shape one dominant large component. The so-called largest connected component of a network measures the collection of actors that are linked to each other by at least one path of intermediaries^[32]. The eroding components result in the small-world network becoming increasingly isolated from the greater outer network and this trend manifests in the decreased formation of bridging ties between the occupants^[33]. As aggregation of members boosts information flow and knowledge transfer, we imagine that the aggregation of isolates and small clusters should correlate positively with WPV of innovation performance. Thus we come to our fifth hypothesis:

Hypothesis 5. The size of largest connected component will correlate positively with increased future WPV of the members.

4 Data and Methods

4.1 Data collection

We chose nanobiopharmaceutical field, which is characterised by a strong reliance on scientific developments and, therefore (at least potentially) involve high levels of interaction among the universities and firms involved in science and those involved in industrial research. The empirical analyses presented in this study draw on the Derwent Innovation Index database (DII) because it is the most comprehensive database covering the data of the main leading patent-issuing authorities including USPTO, JPO, EPO, World Intellectual Property Organization (WIPO) and Sino Intellectual Patent Office (SIPO).

In carrying out a bibliometric analysis of nanotechnology science, Hullmann and Meyer^[34] used "nano*" as the query to identify nanotechnology where * means wildcard, and mentioned that this is a pragmatic approach when the domain is interdisciplinary and difficult to identify^[35]. Similarly, nanobiotechnology documents are retrieved by using nano* and bio* as the query^[36]. The nanobiopharmaceuticals is the application of nanotechnology and biotechnology to pharmaceuticals^[37]. This means that, dissimilar from the interdisciplinarity of two domains (e.g., nanobiotechnology, biopharmaceutics and nanopharmaceutical), the multidisciplinary domain incarnates more comprehensive intellectual information of nanotechnology, biotechnology and pharmaceuticals, and is more difficult to identify.

For conveniences of searching and making out nanobiopharmaceutical patents, we utilize the search strategy recommended by Lenoir and Herron^[17]. Lenoir and Herron^[17] estimated a series of search efforts and provide a search strategy. This method uses the set of 32 bio- and pharma-relevant Keywords Plus® terms including titles, abstracts, key words identifying nanotech research publication production for the purpose of formulating a high-precision query for bio- and pharmananotechnology documents. The query, written in SQL, searching for all records whose KeyWords Plus® field matched any of the 32 terms is performed by Lenoir and Herron^[17] as follows:

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mysql> select * from nano_IDS
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l where ID like 'cytotoxicity' or ID like 'immunoassay' or ID like 'glucose' or ID like 'antibody' or ID like 'singlemolecule' or ID like 'layered double hydroxides' or ID like 'Ascorbic acid' or ID like 'alpha-cyclodextrin' or ID like 'assay' or ID like 'expression' or ID like 'amplification' or ID like 'poly(acrylic acid)' or ID like 'titanium-dioxide films' or ID like 'cadmium-sulfide' or ID like 'block copolymers' or ID like 'glucose-oxidase' or ID like 'anatase TiO2' or ID like 'beta-cyclodextrin' or ID like 'recombination' or ID like 'micellization' or ID like 'Solgel' or ID like 'TiO2 films' or ID like 'nanocrystalline tio2' or ID like 'acrylamide' or ID like 'fluorescence probes' or ID like 'paste electrodes' or ID like 'triton x-100' or ID like 'oxidase' or ID like 'horseradish-peroxidase' or ID like 'binding' or ID like 'photodegradation' or ID like 'DNA hybridization'.
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Therefore, we use the 32 bio- and pharma-relevant topic terms and nano* together as the query to collect the patents. In addition, we add to three prefixes, nano*, bio* and pharm*, as the query to more completely collect the patents. Besides, we use nanobio* (or bionano*) and pharm*, biopharm* and nano*, nanopharm* and bio*, as well as nanobiopharm* (or bionanopharm*) as four complementary queries. Next, we check carefully the abstracts of patents retrieved by the queries to examine and sieve their relevance to nanobiopharmaceuticals. This approach has identified more than 11,000 records in the DII database in the time frame of 1982-2009. The total number of patents obtained by universities in the world is 2,624. Throughout this study, patents only refer to the ones pertaining to the field of nanobiopharmaceuticals unless otherwise stated. Here we only think about last ten years (2000-2009), with speedy development of patents in nanobiopharmaceutical research unless otherwise stated. Here, university-industry collaboration patent refers to the patent that is co-invented by at least one university and one firm. The data comprise a panel data set containing 640 firms and universities participating in university-industry collaboration patents in the field.

4.2 Alliance Network

We apply a rule to guide our construction of the university-industry collaboration networks used in this study. Each alliance includes at least one firm and a university that collaborate on at least a patent in the field of nanobiopharmaceuticals. Any member in each alliance is a firm or a university which has participated in at least one university-industry collaboration patent in the field. Thus, we set up a patent-member database about university-industry collaboration, which is made up of patent and their corresponding members of university-industry collaboration. The patent-member database about university-industry collaboration permits us to construct a unipartite network, where nodes are individual firms or universities, based upon patent data from Derwent Innovation Index database in the field.

4.3 Dependent Variable: Weighted Patent value

One way that knowledge creation is instantiated is in the form of inventions^[38]. Knowledge embedded in artifacts such as inventions stands for the “empirical knowledge” of organizations^[39]. Inventions thus offer a trace of an organization’s knowledge creation. Patents offer a measure of novel invention that is externally validated through the patent examination process^[40]. Patents mirror the inventive and innovative evolution in modern technology, while scientific publications mirror the state-of-the-art of science^[41]. While patents are the output of inventive activity, it is also widely acknowledged that patents offer a trustworthy, though not ideal, measure of innovative activity^[42].

Economists for several decades have tried to apply patent statistics to measure the returns to innovative activity and the value of patent protection, as patent records are one of the only quantifiable and publicly available products of research and development. But the use of patent statistics as measures of economic value has been confronted with a lot of hurdles. Simple patent counts are not very revealing indicators of economic value, as patents are very noisy measures of innovative output with the distribution of patent value highly skew and much of the incentive for innovation resting in the very tail of the value distribution^[43]. The use of patent counts weighted by forward patent citations (that is, references to a patent by later patents) and by other attributes of the patent (for example, the number of claims) have been verified to be better measures of patent value^[44]. This method has had only limited success in identifying appropriate indicators of patent value. For example, Harhoff et al.^[45] discovered that even within the relatively select cohort of full-term patents, citation frequency only augments noisily with reported economic value. An alternative approach has been to apply patent renewal data, since many countries require the payment of a fee so as to keep the patent in force^[46]. The motivation for filing an application in multiple countries is that a patent will bestow its owner monopoly only in the application country. Patent family size can be defined as the number of countries in which the patent is taken out^[47]. It may be used as the basis to establish more refined patent indicators, to research different proxies for patent value or to explore the motivations and strategies of patent applicants. Five uses of patent family data can be put forward: (i) to avoid double counting; (ii) to neutralize home advantage; (iii) to predict applications; (iv) to analyze the internationalization of technology; and (v) to evaluate patent value^[48]. Generally speaking, the more valuable the application to the applicant is, the more broadly the application will be filed^[49]. If the applicant has filed or obtained patents in many different patenting authorities on the same invention, it is a good bet that this patent endows with value to the applicant or his/her company. Based on this point, Moge et al.^[50] recommended taking patent family size as a gauge of the invention's private value. There is some evidence that, patent family size is a better gauge of patent value than patent citations^[51].

One of the challenges for using patents to gauge innovation is that the propensity to patent may vary with industry, resulting in a potential source of bias^[52]. We address this potential bias in three ways. First, we sample only high-tech field: the field of nanobiopharmaceuticals. Innovation was emphasized in this field. Second, the propensity to patent may also differ due to firm characteristics^[40]. We endeavor to control for such sources of heterogeneity by using covariate, Presample Patents (described below), and fixed and random effects in our estimations. Third, we use patent family size instead of simple patent counts as a measure of the invention's patent value. Granted the use of patent value, the next issue is how to go about conceiving a sensible weighting scheme. A straightforward possibility is to weight each patent i by the actual number of patent value in year t , denoted by V_{it} . Thus, if we want to compute an index of weighted patent value (WPV) for, say, the field of nanobiopharmaceuticals in a given year, t , we will have,

$$WPV = \sum_I V_{it}$$

Here I is the set of patents issued by member m during year t in the field. This linear weighting scheme then assigns a value regarded as dependent variable.

4.4 Small world measures

The most recent efforts in this tradition draw extensively on graph theory and social network analysis techniques, to show that the scientific co-authorship network is characterized by the structural properties of small world networks^[53]. Broadly speaking, a small world is a network configuration that is both highly locally clustered and has a short path length, two network characteristics that are normally dissimulative^[25]. This type of structure is thought to be particularly important for both the generation and the diffusion of knowledge.

To infer whether a network is a small world, Watts's model^[25] compares the actual network's characteristic path length L_{actual} and clustering coefficient C_{actual} to a random graph of the same size, where random graphs have both very low characteristic path lengths and low clustering. In particular, the closer the PL ratio (PL of the actual network/ PL of a random graph comparison) is

to 1.0 and the more the CC ratio exceeds 1.0 (CC of the actual network/ CC of the random graph comparison), or simply the bigger the small world quotient (Q), which is CC ratio/ PL ratio, the larger the network’s small world nature. In random connected networks with large n (the number of nodes) and k (the nearest neighbors of node), the characteristic path length L_{random} can be defined as [25] (Watts 1999):

$$L_{random} \approx \frac{\ln(n)}{\ln(k)}$$

The clustering coefficient of a node reflects the degree to which a node’s partners are also buddies with each other. In a random network with n nodes and an average connection number of k , the clustering coefficient can be reckoned according to Watts [25]:

$$C_{random} \approx \frac{k}{n}$$

4.5 Model Specification 1

Independent Variables

Clustering Coefficient. To calculate the actual CC, we decide how many pairs of artists have a shared associate, or how many triads are “closed” [24, 54]. Three different configurations can yield a triad: person A is connected to person B who is connected to person C, both persons A and B are connected to person C or both persons B and C are connected to person A. Three links among persons A, B, and C consist of a closed triad (i.e., a triangle). Thus, Clustering coefficient is a standard way to make out how clustered these networks are [55]:

$$C \approx \frac{3 \times (\text{number of triangles on the graph})}{(\text{number of connected triples of vertices})}$$

Reach. To capture the reach of each network for each time period, we employ a gauge of average distance-weighted reach [56]. This measure is calculated as

$$\text{Average distance weighted reach} \approx \frac{1}{n} \sum_j \frac{1}{d_{mj}}$$

Where n is the number of nodes in the network, and d_{mj} is defined as the minimum distance (geodesic), d , from a focal node m to partner j , where $m \neq j$. Average distance-weighted reach can range from 0 to n , with larger values indicating higher reach. This is a compound measure that takes into account both the number of members that can be reached by any path from a given member, and the path length it takes to get to them. It shuns the infinite path length problem typically associated with disconnected networks by measuring only the path length between connected pairs of nodes, and it offers a more significant measure than the simple average path length between connected pairs by factoring in the size of connected components.

Clustering×Reach. Mentioned above, we forecast that the combination of clustering and reach will have a positive impact on members’ WPV of innovation, and thus include the interaction term, Clustering×Reach.

Firm-Level Control Variables.

Presample Patents. To control for unobserved heterogeneity in member’s patenting, we follow the presample information approach of Blundell et al. [57] and reckon the variable Presample Patents as the totality of patents acquired by a member in the five years prior to its entry into the sample.

Betweenness Centrality.

Betweenness centrality is on the basis of the number of shortest paths passing through a vertex. Vertices with a high betweenness play the role of linking different groups. In the following formula [58], g_{jmk} are all geodesics linking node j and node k which pass through node m ; g_{jk} is the geodesic

distance between the vertices of j and k . The term g_{jmk}/g_{jk} captures the probability that member m is involved in the shortest path between j and k .

$$C_B(m) = \sum_{j,k \neq m} \frac{g_{jmk}}{g_{jk}}$$

In social networks, vertices with high betweenness are “pivot points of knowledge flow in the network” [59]. Betweenness centrality can reflect the transmission of technological knowledge, which may promote the emergence of new technology [60].

Betweenness centrality is the total of these evaluated probabilities over all pairs of members (excluding the m th member) in the network. It has a minimum of zero, obtained when m falls on no links. Its maximum is $(g-1)(g-2)/2$, which is the number of pairs of nodes not including m , we can normalize it as:

$$C_B^1(m) = \sum_{j,k \neq m} \frac{g_{jmk}}{g_{jk}}$$

to make the gauge comparable across time and networks.

Degree. Network nodes (actors) which directly connected to a specific node are in the neighborhood of that specific node. The number of neighbors is defined as nodal degree, or degree of connection. Granovetter [61] proposed nodal degree is proportional to probability of obtaining resource.

Network Control Variables

Network Density. We control for the overall density of the network with the variable network density, calculated for each network and time period. We do so because the rate and extent to which information diffuses increases with density [62].

Centralization. The centralization of a network is higher if it contains very central vertices as well as very peripheral vertices. To control for network centralization, we make use of Freeman’s index of group betweenness centralization [58], computed for each network and time period. Group betweenness centralization for network j in year t is calculated as follows:

$$\text{Betweenness centralization}_{jt} = \frac{\sum_{m=1}^g C_B^2(n_m)}{C_B^2(n^*)} \cdot \frac{1}{g}$$

Here $C_B^2(n^*)$ is the largest realized normalized betweenness centrality for the set of members in network j in year t , $C_B^2(n_m)$ is the normalized betweenness centrality for member m (in network j for year t), and g is the number of members. This variable is expressed as a percentage and can range from zero, where all members have the same individual betweenness centrality, to 1, where one member links to all other members.

Firm R&D Intensity. Because R&D expenditures are not available for members, in investigating the robustness of our results, we utilize a control variable (stock of patents obtained in the past four years) that has been demonstrated to be highly correlated with annual firm-level R&D expenditures [12].

The dependent variable in this study, WPV, is a count variable and takes on only nonnegative integer values. The linear regression model is inadequate for modeling such variables because the distribution of residuals will be heteroscedastic nonnormal. A Poisson regression approach is appropriate to model count data [63]. However, the Poisson distribution includes the strong assumption that the mean and variance are equal. Patent data often exhibit overdispersion, where the variance exceeds the mean [63]. In the presence of overdispersion, coefficients will be evaluated consistently, but their standard errors will generally be underestimated, giving rise to spuriously high levels of significance. A generally utilized alternative to the Poisson regression model is the negative binomial model. The negative binomial model is a generalization of the Poisson model and allows for overdispersion by incorporating an individual, unobserved effect into the conditional

mean ^[63]. The panel data performance of the negative binomial model accommodates explicit control of persistent individual unnoticed effects through both fixed and random effects.

A final estimation issue concerns the suitable lag structure of the independent variables. Based on previous research that investigates the relationship between interfirm alliances and innovation ^[64], we make use of alternative lags of our independent variables relative to our dependent variable. We evaluate models using one-year, two-year, and three-year lags. We do so to seek after the robustness of our findings across alternative specifications. All models are estimated with Stata 10.0. The model we evaluate takes the general form provided below. Variables are indexed across members (*m*), and time (*t*):

$$WPV_{m,t+1(2,3)} = f(Clustering_t, Reach_t, Clustering^2_t, Reach^2_t, Centrality_{mt}, Degree_{mt}, Centralization_t, Density_t, PresamplePatents_{mt}, 2003, 2004, 2005, 2006, 2007)$$

4.6 Model Specification 2

In order to explore the relationship between small world nature in university-industry collaboration network and WPV of innovation output, the conditional mean of the negative binomial patent function for member *m* in year *t+1* is described in Eq. (1):

$$E_{m,t+1} [WPV_{m,t+1} | Intensity_{m,(t-4):(t-1)}, Inventors_{m,(t-4):t}, Corp_{m,(t-4):t}, LC_{m,(t-4):t}, CCration_{m,(t-4):t}, CCration2_{m,(t-4):t}, PLration_{m,(t-4):t}, Q_{m,(t-4):t}, Q2_{m,(t-4):t}] = \exp(\beta_0 + \beta_1 Intensity_{m,(t-4):(t-1)} + \beta_2 Inventors_{m,(t-4):t} + \beta_3 Corp_{m,(t-4):t} + \beta_4 LC_{m,(t-4):t} + \beta_5 CCration_{m,(t-4):t} + \beta_6 CCration2_{m,(t-4):t} + \beta_7 PLration_{m,(t-4):t} + \beta_8 Q_{m,(t-4):t} + \beta_9 Q2_{m,(t-4):t})$$

Where $E_{m,t+1}$ represents the conditional expected number of WPV of the patents granted to member *m* in year *t+1*, and it is decided primarily by R&D expenditures, personnel, cross-border corporation and small-world structure in previous years. However, because R&D expenditures are not available for most of members, we make use of a control variable-intensity (stock of patents obtained in the past four years) that has been shown to be highly correlated with annual firm-level R&D expenditures ^[12]. In order to evaluate the impact of small world and the size of largest component during five-year moving windows on the next year patent output, dependent variable is calculated in year *t+1* while all independent variables with an exception of intensity are calculated from years *t-4* to *t*. Dependent variable $WPV_{m,t+1}$ is WPV of patents granted to member *m* in year *t+1*. There are six explanatory variables. The size of the largest component (LC) is counted as the proportion of members included in the largest connected component of the network.

Clustering coefficient is gauged by CC ration and its squared term CC ration2, while path length is gauged by PL ration. Small world nature is gauged both as linear (Q) and squared terms (Q2), too. All these network indexes mentioned above are calculated for the network formed for member *m* during year *t-4* to *t*.

The model specification 2 also contains control variables for R&D expenses, personnel and cross-border co-patents, as these factors are imperative for patent output. We use R&D intensity mentioned above to control the expenditure input for member. The personnel are controlled by the number of inventors for member *m* to account for the number of people engaged in invention. The cross-border collaborations (Corp) are controlled by the number of institutions in the five-year networks with at least one other member.

5 Results

5.1 Development trend of university-industry collaboration

In order to more completely seek for the development trend of university-industry collaboration and predict this development trend in the field, the collected data are then

² Different lags and window sizes did not demonstrate substantively different results

preprocessed as follows. The online Loglet Lab curve fitting system³ is adopted to fit the collected data during 1982-2009. The following three parameters are provided by automatic computation of the curve fitting system and can be made a choice by operator's own judgment: (1) Ceiling value; (2) Growth time; (3) Midpoint^[65].

In Figure 1 we present the development trend forecast using the Loglet Lab S-curve model for the amount of university-industry collaboration patent. As shown by Figure 1, the development trend has the growth time of 9.4 years, and the inflection point of the development trend occurs at year 2005 if the development trend analyzed is set to begin at year 1991 when first university-industry patent was invented in the field of nanobiopharmaceuticals. According to Figure 1 and the idea of bibliometrics^[66], university-industry collaboration patent would continue to grow about 9.4 years after the inflection point, 2005 and will then reach the predicted saturation time in the field. University-industry collaboration patent will be invented about 91.4 cases, the ceiling value, pertinent to nanobiopharmaceuticals per year after it reaches the predicted saturation time.

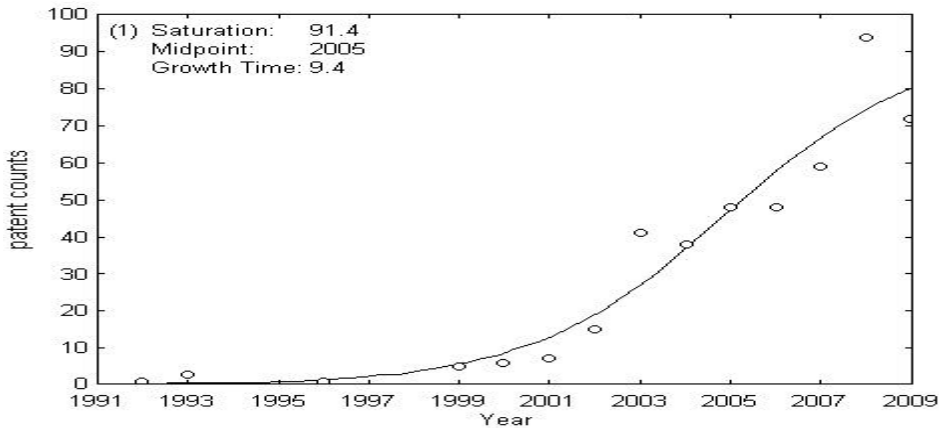


Fig. 1 Development trend forecast for the amount of university-industry collaboration patent

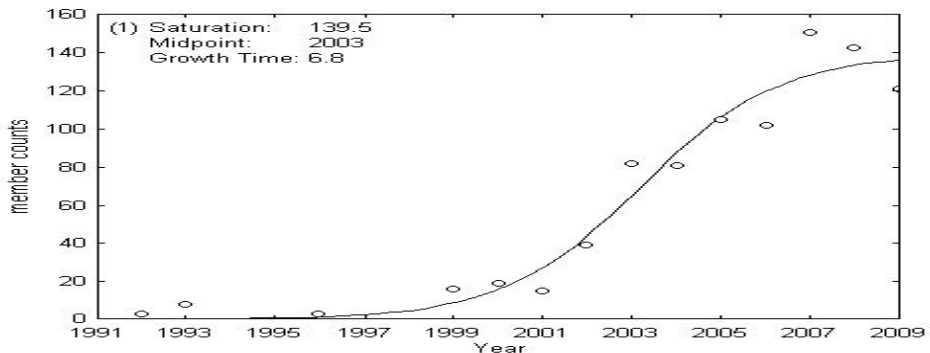


Fig. 2 Development trend forecast for the amount of members of university-industry collaboration patent

³ <http://phe.rockefeller.edu/LogletLab>

Similarly, in Figure 2 we present the development trend forecast using the Loglet Lab S-curve model for the amount of corresponding member of university-industry collaboration patent. Firms and universities are gradually linking together over time.

According to Figures 1-2, we find that although nanobiopharmaceuticals has witnessed a sharp increase in the number of patents, university-industry collaboration research develops at a relative slow pace, indicating that they lack the ability to work hard together to exploit the potential economic value of their patents in the field.

There may be following three reasons for this relatively slow pace. First, in terms of the supply and demand, according to level of technology development and stage in the product cycle, the scope of industry networks maybe are sufficient at this stage and they do not need to interact with universities. Second, some firms prefer not to collaborate with universities because: (i) lack of efficient communication channels for the research results; (ii) the research results are difficult to commercialize; (iii) the research results are immature; and (iv) the research results have high uncertainty from the market place perspective. Third, in terms of mission orientation of universities, most of the research activities of universities are not market oriented and mainly focus on knowledge generation and accumulation. The researchers of these institutions often pursue the technology novelty and seldom consider the market prospects of their research work^[1].

5.2 Has the interaction of Clustering and Reach a positive effect on member’s patent value?

The preliminary bibliometric investigations and analyses above lead readers to grasp the general development profiles for the university-industry collaboration in the field. In next analysis, we test our hypothesis that predicts a positive effect of the interaction of Clustering and Reach on WPV of member’s innovation. The interaction term, Clustering`Reach, does not gain statistical significance at conventional levels in the model specified with a three-year lag, using either fixed or random firm effects (model 9). The coefficient for Clustering ` Reach is positive and statistically significant in models using both one- and two-year lags (models 3 and 6). This result is suitable for models using both fixed and random firm effects. Thus, our hypothesis obtains strong support in models using one- and two-year lags. Our results are similar with the results obtained by Schilling and Phelps^[12], and the coefficient for Clustering`Reach is positive and statistically significant in models using both twoand three-year lags in their results.

Table 1 Panel negative binomial regression models with fixed effects (N = 640; obs = 6219)

	WPV _{mt+1}			WPV _{mt+2}			WPV _{mt+3}		
	1	2	3	4	5	6	7	8	9
Random effects									
Consta nt	- 6.581** * (0.571)	- 9.847* ** (0.673)	-2.686 (1.932)	- 6.239* ** (0.583)	- 6.307** * (0.617)	11.967* ** (2.087)	- 1.511** (0.591)	- 1.105* (0.584)	1.788 (1.95)
Densit y	4.927** * (0.995)	- 3.926* ** (1.260)	- 12.486* ** (2.476)	9.073* ** (0.898)	10.804* ** (1.048)	- 12.543* ** (2.683)	4.131** * (0.853)	5.896* ** (0.961)	2.106 (2.61)
Averag e distanc e	- 4.172** * (0.507)	- 7.190** * (0.606)	- 3.350** * (1.139)	- 3.518** * (0.523)	- 3.250** * (0.540)	- 6.371** * (1.176)	-0.566 (0.541)	-0.549 (0.536)	- 2.065* (.114)

Centralization	-267.208*** (33.907)	-429.266*** (38.851)	-197.016*** (70.487)	-292.035*** (33.665)	-290.393*** (38.040)	-300.117*** (75.242)	-147.672*** (42.430)	-120.046*** (41.563)	-29.80 (71.6)
Centrality	1.237** (0.432)	1.248** (0.422)	1.218** (0.422)	1.020** (0.473)	1.061** (0.480)	0.999** (0.475)	1.589** (0.477)	1.540** (0.477)	1.523* (0.47)
Degree	0.022** (0.029)	0.040** (0.030)	0.041** (0.029)	0.004** (0.030)	0.005** (0.031)	0.011** (0.031)	0.079** (0.034)	0.059* (0.035)	0.059* (0.03)
Intensity	0.261** (0.035)	0.254** (0.035)	0.244** (0.035)	0.224** (0.038)	0.224** (0.038)	0.205** (0.038)	0.159** (0.042)	0.167** (0.042)	0.162* (0.04)
Presample	0.190** (0.032)	0.183** (0.031)	0.174** (0.031)	0.156** (0.034)	0.155** (0.034)	0.140** (0.034)	0.091** (0.038)	0.100** (0.038)	0.096* (0.03)
Clustering		3.351** (0.335)	-3.410** (1.737)		-0.770** (0.190)	-17.669** (1.850)		-0.239 (0.179)	-2.973* (1.77)
Reach		-0.822** (0.127)	-2.220** (0.377)		0.334** (0.113)	-3.415** (0.425)		-0.203* (0.118)	-0.793 (0.35)
Clustering×Reach			3.252** (0.823)			8.340** (0.909)			1.344 (0.86)
Log Likelihood	-6443.515	-6360.593	-6352.573	-6427.564	-6419.503	-6373.840	-6367.519	-6357.421	-6356

Notes: (1)*p < 0.1, **p < 0.05, ***p < 0.01.(2)Standard errors are in parentheses

In order to deeply understand the implication of the interaction effect, we should understand the nature of the coefficients for Clustering and Reach in Models 3 and 6 in Table 1 and 2, using model specification 1. The estimated coefficients for Clustering and Reach in these models are simple effects rather than true main effects owing to the significance of the interaction term^[27]. Consequently, the effect of each on WPV is conditioned on the other variable taking on the value of zero. For example, the coefficient estimate of -17.563 for Clustering in Model 6 (Random Effects) supposes that the value of Reach is equal to zero (thus removing the interaction effect with Reach). Thus, the negative sign of the coefficient for Clustering cannot be interpreted as a negative (main) effect of Reach on WPV^[12]. While the impact of Clustering is indeed negative when Reach

is equal to zero, the effect becomes positive when values of Reach exceed some value (the range of Reach is 1.470–2.638).

Table 2 Panel negative binomial regression models with random effects(N = 640; obs = 6219)

	WPV _{mt+1}			WPV _{mt+2}			WPV _{mt+3}		
	1	2	3	4	5	6	7	8	9
Random effects									
Constant	-6.581** * (0.569)	-9.658** * (0.672)	-2.62 (1.922)	-5.959* ** (0.582)	-6.073** * (0.617)	12.071* ** (2.078)	-1.357** (0.588)	-0.982* (0.583)	2.029 (1.94)
Density	4.507** * (0.994)	-4.361* ** (1.258)	-12.748* ** (2.459)	8.649* ** (0.898)	10.271* ** (1.047)	-12.871* ** (2.6680)	3.781** * (0.854)	5.432* ** (0.961)	1.490 (2.59)
Average distance	-3.918** * (0.505)	-6.981** * (0.606)	-3.211** * (1.134)	-3.256** * (0.522)	-2.985** * (0.542)	-6.557** * (1.171)	-0.723 (0.538)	-0.726 (0.536)	-2.301 (1.10)
Centralization	-250.790 *** (33.778)	-417.167 *** (38.792)	-188.936 *** (70.167)	-275.123 *** (36.572)	-276.016 *** (38.045)	-310.431 *** (74.965)	-137.699 *** (42.216)	-111.978 *** (41.477)	-18.10 (71.3)
Centrality	1.486** * (0.387)	1.487** * (0.375)	1.460** * (0.375)	1.292** * (0.426)	1.338** * (0.433)	1.248** * (0.4290)	1.841** * (0.426)	1.805** * (0.427)	1.786* (0.42)
Degree	0.005** * (0.029)	0.011** * (0.029)	0.012** * (0.029)	0.025** * (0.030)	0.022** * (0.030)	0.018** * (0.030)	0.046** * (0.034)	0.029** * (0.034)	0.030* (0.03)
Intensity	0.298** * (0.034)	0.293* ** (0.034)	0.283** * (0.034)	0.257** * (0.038)	0.257** * (0.038)	0.238** * (0.038)	0.194** * (0.046)	0.199* ** (0.046)	0.194* (0.04)
Presample	0.220** * (0.031)	0.214** * (0.031)	0.206** * (0.031)	0.182** * (0.034)	0.182** * (0.034)	0.167** * (0.034)	0.120** * (0.041)	0.126** * (0.041)	0.122* (0.04)
Clustering		3.358** * (0.335)	-3.292* (1.730)		-0.773** * (0.190)	-17.563* ** (1.843)		-0.247 (0.179)	-3.096 (1.76)

Reach		-0.803** * (0.127)	-2.179** * (0.375)		0.364** * (0.112)	-3.369** * (0.424)		-0.171 (0.118)	-0.787 (0.39
Clustering×Reach			3.197** * (0.819)			8.288** * (0.905)			1.400 (0.86
Log Likelihood	-9031.821	-8947.154	-8939.319	-9054.095	-9045.965	-9000.464	-9012.409	-9003.792	-9002.

Notes: (1)*p < 0.1, **p < 0.05, ***p < 0.01;(2)Standard errors are in parentheses

Similarly, the effect of Reach is negative (although not statistically significant) when Clustering is zero, but becomes positive for values of Clustering greater than some value (the range of Clustering is 0–1). Our hypothesis is underpinned by the fact that the impact of Clustering or Reach will be positive when the other takes a relatively small value, and augments its positive effects as the other increases. These mutually reinforcing impacts are in conformity with the symmetrical nature of multiplicative interaction effects [27].

The results connected with the control variables are also worthy of discussion. The effect of betweenness centrality on subsequent members’ WPV achieves statistical significance in any of the estimated models. However, the effect of betweenness centralization on subsequent members’ WPV achieves significant negative effect in almost all of the estimated models. One elucidation of this maybe is following reasons. On the one hand, betweenness centrality represents an actor’s position within the shortest path between two other actors, which implies that the actor can control the interactions between the two nonadjacent actors and function as a point of control in the communication [58]. On the other hand, if a network has a high level of betweenness centralization, the emerging core–periphery structure may result in preferential attachment. This results in excessively dependence on center nodes, and leaves peripheral nodes relatively detached.

The intensity variable has positive and significant effect on members’ WPV in all models. R&D expenditures investment is the main input in the innovation system, which is a direct result of the push for advancement in science and technology. However, Presample patents haven a statistically significant positive effect on members’ (WPV) in all models. It indicates its importance as a control for firm-level unobserved heterogeneity [12]. Degree has positive and significant effect on members’ WPV in all models as we expected. The diffusion of knowledge is vital for collaboration researchers in a large, intricate, and fast changing society. The firms can offer the universities with market information and user feedback; while universities play vital roles not only as the creators of new technology but also as the suppliers of the much desired capable personnel. Therefore, the R&D capability of them can be improved through such kind of cooperation.

Among the other variables in the models, most were not consistent in terms of sign and significance. This might be partly owing to the moderate-to-large correlations among the network measures (i.e., Centralization, Density, Reach, Clustering, and Clustering×Reach) [12]. This multicollinearity may impact on the robustness of our main finding because parameter estimates are unstable to very small changes in the data when a good deal of collinearity is present, sometimes leading to the signs on estimated coefficients to flip (known as the “wrong sign” problem) [67].

To study the impact of multicollinearity on our main result, we rerun each of the models in Table 1, 2 with Centralization, density and degree removed, respectively (not reported here). The results for Reach, Clustering, and Clustering×Reach keep substantively unchanged across all models.

5.3 Has small world collaboration network properties a positive effect on member’s patent value?

The panel data implementation of the negative binomial model during the reference period (2000–2009) accommodates explicit control of persistent individual unobserved effects through both fixed and random effects. The fixed-effects negative binomial model is favored. A Hausman test refuses random effects specification at the 0.1% level. Table 3 lists summary statistics average per year using model specification 2. The mean of small world Q is 516.649, which verifies the existence of small world characters.

Table 3 Summary statistics (n = 640)

Variable	Mean	Std.Dev.	Min	Max
WPV	2.731	5.701	0.100	63.600
Intensity	1.520	3.266	0.001	40.100
No.of inventors	2.616	3.917	0.200	41.100
No.of cross-border corporations	3.993	6.232	0.100	64.200
Largest component size	0.098	0.059	0.052	0.235
Clustering coefficient ratio	128.854	79.703	21.636	239.326
Path length ratio	0.260	0.052	0.207	0.376
Small world Q	516.649	305.206	57.557	831.254

Table 4 presents our regression analysis of WPV using model specification 2. At the beginning model 1 takes into account the control variables. Then we consider the size of the largest component measure in model 2 and small world measures in models 3 and 4. Here we utilize two specifications of the small world model as previous study ^[11]. We first separately embrace the PL ration and CC ration along with its square in model 3. Then we look into their interaction term Q and its square in model 4. The intensity variable is positive and significant effect on members’ WPV in all models. It indicates that R& D expenditures have significant positive relationships with WPV. It is generally convinced that more R&D capital can bring more innovation output. Both personnel and the cross-border corporations have positive relationships with WPV of patent output but they fail to reach a 10% level significance in some of the models. One explanation for this can be that as mentioned above, Lack of efficient communication channel to the research results firms and universities is an important barrier. Lack of skilled persons and lack of innovation-relevant information (including technology and market information) is important barriers on innovation as nanobiopharmaceuticals is quite a new technology.

The size of largest component show strong influence on members’ subsequent WPV, which is consistent with the results obtained by Fleming ^[23] and contradictory to the results obtained by Chen and Guan ^[13]. Isolates and small components that did not have been involved in the largest component would be left without access to new ideas and results and thus their creativity would be hampered. In this condition, as the creativity materials are limited, if they do not enter into the largest component, there would be less opportunities to access new ideas and information ^[23].

Table 4 Conditional fixed-effect negative binomial models of patent value in year t+1.

Variable	Model1	Model 2	Model3	Model4
Intensity	0.026***(0.003)	0.024***(0.004)	0.028***(0.003)	0.025***(0.004)
No. of inventors	0.002(0.003)	0.001**(0.005)	0.001** (0.003)	0.002* (0.003)
No. of cross-border	0.003**(0.005)	0.011**(0.003)	0.010*(0.005)	0.009(0.006)

collaborations				
Largest component size		6.757*(0.577)		
Clustering coefficient ratio			0.021***(0.002)	
Clustering coefficient ratio squared			-0.001***(0.001)	
Path length ratio			-2.814***(0.806)	
Small world Q				0.005***(0.012)
Small world Q squared				-0.001***(0.001)
Constant	-2.189***(0.040)	-1.504***(0.067)	-2.374***(0.285)	-3.331***(0.107)
Log Likelihood	-6683.453	-6599.182	-6564.724	-6585.773

Notes: (1)*p < 0.1, **p < 0.05, ***p < 0.01;(2)Standard errors are in parentheses

We forecast a parabolical relationship between our network’s level of small world nature and the subsequent WPV of patent output. Results of models 3 and 4 are both consistent with our prediction. The linear term of clustering coefficient ratio is positive and significant, and the quadratic term is negative and significant, which together display an overturned U-shaped relationship between clustering and WPV of patent output. As expected, path length has a negative and significant contribution to WPV, implying that shorter path length can bring more WPV. Their interaction term, i.e., the small world Q is positive and significant, and the squared term Q2 is negative and significant, which together display an overturned Ushaped relationship between small world nature and WPV of patent output, implying that an intermediate level of small world nature would better enhance WPV of innovation performance, while low and high levels of it may get in the way of WPV of innovation.

In sum, the results of the empirical study verify our hypothesis of positive and statistically significant impact between Clustering ´ Reach and innovation output using one- and two-year lags. While it failed to confirm statistical significance at conventional level with a three-year lag. The results of the empirical study also verify our hypotheses of the parabolic relationship between clustering coefficient and WPV of innovation performance , the negative relationship between path length and WPV of innovation performance, the parabolic relationship between small world quotient and WPV of innovation performance , and the positive relationship between the size of largest component and WPV of innovation performance as described in Hypotheses 2–5.

Concluding remarks

This research makes up the existing literature by providing an empirical investigation of the impact of network property for university-industry collaboration network on WPV of the innovative output at firm level. This paper illustrates members taking a part in alliance networks that combine a high degree of clustering and reach will display more WPV of knowledge creation than members in networks without these characteristics. This study also shows that small world structure does profit WPV of innovation but it is limited to a special scope after which the impacts reverse. Our results offer suggestions to policy makers and managers. They can take account of social networks when making decisions for technology, industry or firm location. Their decisions impact on the formation of social networks and then social networks influence their performance. When the networks they participated in are small world networks, they would have more chances to acquire fresh and unfamiliar information easily. Therefore, when managers select positions to locate their firms and universities, the social networks should be thought over. The firm agglomeration should be maintained at moderate level rather than too dispersed or too gathered

together, for if too scattered it would be hard for communications within industry and university, while too converged would induce much repetitive and redundant information and make that the ideas most probably to flow can be traditional rather than fresh opinions due to the common information effect and because newcomers discover it difficult to land “slots” on productions. Both too high and too low agglomeration would hold back innovation activities. Therefore, policy makers should consider both conditions to develop the social networks to appropriate small world characteristic^[13, 68].

While at the firm level, knowledge diffusion is a two-edged sword. On the one hand, the participation in the network can make their technology spillover and contribute to others. On the other hand, they can also obtain spillover and retribution from others^[69]. Firms can go into the networks by employing employees from competitors, universities, suppliers or partnering with them. The policy makers can motivate the network formation and the knowledge diffusion by encouraging personnel mobility and industry – university cooperation. In order to promote university-industry interaction and explore how to balance the too dispersed or too aggregated, we explore what are the optimal levels of small world. Figure 3 shows the magnitude of the effect of Q on WPV. The results signify that at the predicted bliss point of Q (about 400). Consistent with the results^[13, 33], the benefit of small world may rise only up to a marginal value after which point they shift negative. Excessive structural connectivity and small world decrease some of the creative distinctiveness of clusters, which can homogenize the pool of creative material. A small world is a network configuration that is both highly locally clustered and has a short path length, while reach is closely related to path length. Therefore, we can appropriately adjust reach and clustering to get to this optimal level. According to this optimal level, policy makers should place greater emphasis on creating effective network structure arrangements to promote creativity and performance.

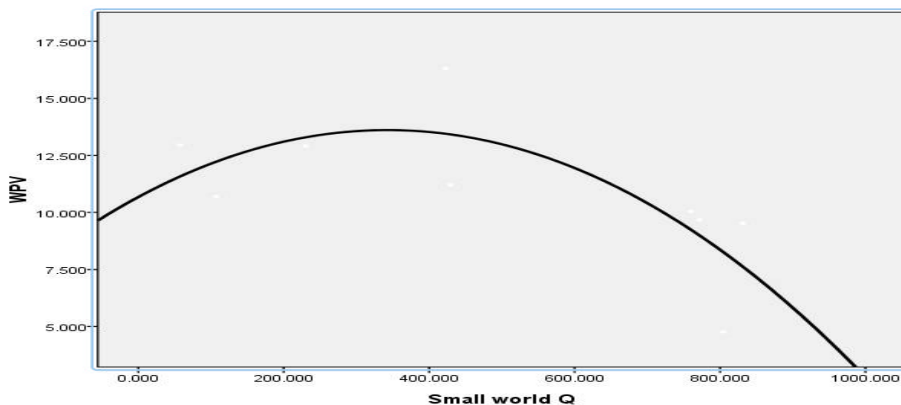


Fig.3 The relationship between the small world Q and WPV artistic success.

Collaboration ties are key tools through which companies acquire external knowledge, including technical breakthroughs and new insights to problems and failures (e.g. Powell et al.^[70]). However, the collaboration is still far from efficient in terms of performance indicators such as WPV, to measure innovation in the field. Lack of efficient communication channel to the research results of universities and uncertainty of market perspective of the research results may be important factors to hinder commercializing research results produced by universities. Lack of skilled persons and lack of innovation-relevant information (including technology and market information) may be also crucial barriers on innovation as nanobiopharmaceuticals is quite a new technology. It is necessary to exploit an effective information platform among the collaboration partners through combining the network with their intranets. Policymakers and university leaders should have a clear mind in raising a positive cycle of commercializing activities and research publication of universities. Academic research commercialization inspires the faculty members to make their research agenda more basic- and applied-orientation integrated^[71].

From a policy perspective, policy makers should place greater emphasis on creating effective institutional arrangements or policies to promote university-industry cooperation network, and constitute a stable platform for cooperation to attain mutual learning between U-I linkages. For example, Science parks (SPs) and business incubators (BIs) are believed to offer an effective tool for university and industry to interact^[72] and we should give full play to their abilities and role. From a viewpoint of policy, more policies contributing to the linkages with universities for firms should be made. Under this model, the firms can offer the universities with market information and user feedback; the R&D capability of the enterprises can be improved through such kind of cooperation. Universities play vital roles not only as the creators of new technology but also as the suppliers of the much desired capable personnel, and as the media players who match the economic changes with the changes in society. So, we focus our analysis on UI collaborations, which take an irreplaceable role in contrast to alliances between firms. From a managerial viewpoint, it shows that cooperation between UI linkages is an effective approach to enhancing their innovation performance. Thus, it is necessary for firms to apply various cooperation networks (formal or informal relationships, such as cooperative alliances and personal networks) to acquire external knowledge and resources. Furthermore, we should establish a sound management mechanism of U-I cooperation. Suitability of management offers three underlying determinants: management profile, services provided and innovative ideas^[73]. Aernoudt validated the role of management as critical for the success of SPs and BIs^[74].

References

- [1] J.C. Guan, R.C.M. Yam, C.K. Mok. Collaboration between industry and research institutes/universities on industrial innovation in Beijing, China[J]. *Technology Analysis & Strategic Management*. 2005,17 (3):339-353.
- [2] M. Balconi, S. Breschi, F. Lissoni. Networks of inventors and the role of academia: an exploration of Italian patent data[J]. *Research Policy*, 2004,33(1): 127-145.
- [3] J. Z. Li. The reason and organization of R&D cooperation', *Science Research Management*[J]. 2000:21 (1):106–112 (in Chinese).
- [4] B. Y. Godin, Y. Gingras. The place of universities in the system of knowledge production[J]. *Research Policy*, 2000,29:273–278.
- [5] S.X Zeng, X. M. Xie, C.M. Tam. Relationship between cooperation networks and innovation performance of SMEs[J]. *Technovation*, 2010,30(3):181-194.
- [6] X. Gao , J.C. Guan. Networks of scientific journals: An exploration of Chinese patent data[J]. *Scientometrics*,2009,80(1):283-302.
- [7] B. Latour. *Science in Action: How to Follow Scientists and Engineers through Society*[M]. Oxford: Oxford University Press, 1987.
- [8] S. Mancinelli, M. Mazzanti. Innovation, networking and complementarity, Evidence on SME performances for a local economic system in North-Eastern Italy[J]. *Annals of Regional Science*, 2008,43(3).
- [9] F. Brioschi., M.S. Brioschi, I. G. Cainell. From the industrial district to the district group: an insight into the evolution of local capitalism in Italy[J]. *Regional Studies*, 2002,36 (9):1037–1052.
- [10] W. Becker, J. Dietz. R&D co-operation and innovation activities of firms—evidence for the German manufacturing industry[J]. *Research Policy*, 2004:33 (2):209–223.
- [11] B. Uzzi, J. Spiro. Collaboration and creativity: The small world problem. *American Journal of Sociology*[J]. 2005,111,447–504.
- [12] M. A. Schilling, C.C. Phelps. Interfirm collaboration networks: The impact of large-scale network structure on firm innovation[J]. *Management Science* , 2007,53(7):1113–1126.
- [13] Z.F. Chen, J.C. Guan. The impact of small world on innovation: An empirical study of 16 countries[J]. *Journal of Informetrics*, 2010(4): 97–106.
- [14] J. Owen-Smith, et al.. A Comparison of U.S. and European University-Industry Relations in the Life Sciences[J]. *Management Science* , 2002,48(1): 24-43.

- [15] G. George, S.A. Zahra, D.R. Wood. The effects of business-university alliances on innovative output and financial performance: a study of publicly traded biotechnology companies[J]. *Journal of Business Venturing*, 2002,17(6):577-609.
- [16] U. Cantner, H. Graf. The network of innovators in Jena: An application of social network analysis[J]. *Research Policy*, 2006:35(4):463-480.
- [17] T. Lenoir, P. Herron, Tracking the current rise of chinese pharmaceutical bionanotechnology.<http://www.ncbi.nlm.nih.gov/pubmed/19838996>, *Journal of Biomedical Discovery and Collaboration*, 2009,4 (8).
- [18] M. Keenan. Identifying emerging generic technologies at the national level: the UK experience[J]. *Journal of Forecasting* 2003,22 (2–3) :129–160.
- [19] V. Koppikar, S. Maebius, J. Rutt. Current trends in nanotech patents: a view from inside the patent office[J]. *Nanotechnology Law & Business*, 2004,1 (1) :1–7.
- [20] J. T. Klein, *Interdisciplinarity*, Detroit[M]. MI:Wayne State University Press, 1990.
- [21] Q. J. Zhao, J.C. Guan. International collaboration of three ‘giants’ with the G7 countries in emerging nanobiopharmaceuticals[J]. *Scientometrics*, 2011:87(1):159-170.
- [22] R Guimera, A. N. Luis, L. Amaral. Cartography of complex networks: Modules an universal roles, *Journal of Statistical Mechanics*[J]. Theory, and Experiments, 2005,2:02001.
- [23] L. Fleming, C. King, A. I. Juda. Small worlds and regional innovation[J]. *Organization Science*, 2007,18:938–954.
- [24] M. E. J. Newman. Scientific collaboration networks: I. Network construction and fundamental results[J]. *Physical Review E*, 2001,64 :016131.
- [25] D. J. Watts. *Small worlds: the dynamics of networks between order and randomness*[M]. Princeton, N.J., Princeton University Press, 1999.
- [26] M. T. Hansen. Knowledge networks: Explaining effective knowledge sharing in multiunit companies[J]. *Organ. Sci.* 2002,13: 232–250.
- [27] J. Jaccard, R. Turrisi., *Interaction effects in multiple regression* sage[J]. Thousand Oaks, CA. 2003.
- [28] A. Zaheer, G. G. Bell. Benefiting from network position: Firm capabilities, structural holes, and performance., *Strategic Management Journal*[J].2005,26(9):809–825.
- [29] B. Gay, B. Dousset. Innovation and network structural dynamics: Study of the alliance network of a major sector of the biotechnology industry[J]. *Research Policy*, 2005:34(10): 1457–1475.
- [30] M. Granovetter. Economic action and social structure: The problem of embeddedness[J]. *American Journal of Sociology*, 1985,91: 481–510.
- [31] D. J. Watts, S. H. Strogatz. Collective dynamics of ‘small-world’ networks[J]. *Nature*, 1998,393(6684):440–442.
- [32] J. Moody. The structure of a social science collaboration network: disciplinary cohesion from 1963–1999[J]. *American Sociological Review* , 2004,69:213–38.
- [33] R. Gulati, M. Sytch, A. Tatarynowicz. The Rise and Fall of Small Worlds: Exploring the Dynamics of Social Structure[J] *Organization Science*, doi 10.1287/orsc.1100.0592, 2010.
- [34] A. Hullmann, M. Meyer. Publications and patents in nanotechnology, An overview of previous studies and the state of the art[J] *Scientometrics*, 2003, 58 (3) :507-527.
- [35] J.C. Guan, N. Ma. China’s emerging presence in nanoscience and nanotechnology: A comparative bibliometric study of several nanoscience ‘giants’ [J]. *Research Policy*, 2007,36(6) : 880-886.
- [36] Y. Takeda, S. Mae, Y. Kajikawa, K. Matsushima. Nanobiotechnology as an emerging research domain from nanotechnology: A bibliometric approach[J]. *Scientometrics*, 2009,80(1):25-40.
- [37] K.K. Jain. *The Handbook of Nanomedicine*[M]. Humana Press, Totowa USA ,2008.
- [38] J. Schmookler. *Invention and economic growth*[J].Cambridge: Harvard University Press,1966.
- [39] A. Hargadon, A. Fanelli. Action and possibility: Reconciling dual perspectives of knowledge in organizations. *Organization Science*[J]. 2002,13 :290-302.
- [40] Z. Griliches. Patent statistics as economic indicators: a survey[J]. *Journal of Economic Literature* 28 (December), 1990:1661–1707.

- [41] E. C. Engelsman, A. F. J. Van Raan. A patent-based cartography of technology[J]. *Research Policy*, 1994,23(1):1–26.
- [42] Z. J. Acs, D. B. Audretsch. Patents as a measure of innovative activity[J]. *Kyklos*, 1989,42(2) :171–180.
- [43] A., Gambardella, D. Harhoff, B. Verspagen.The value of European patents[J]. *European Management Review*, 2008,5 (2):69–84.
- [44] B.H. Hall, A.B. Jaffe, M. Trajtenberg. Market value and patent citation[J].*RAND Journal of Economics* ,2005,36 (1):16–38.
- [45] D. Harhoff, F. Narin, F. Scherer, K. Vopel.Citations frequency and the value of patented inventions[J]. *Review of Economics and Statistics*, 1999,81 (3) :511–515.
- [46] J. Bessen. The value of U.S. patents by owner and patent characteristics[J]. *Research Policy*, 2008,37 :932–945.
- [47] J. Putnam. The value of international patent rights, Unpublished doctoral dissertation[J]. Yale University, New Haven, CT, 1996.
- [48] C. Martínez . Patent families: When do different definitions really matter? [J]. *Scientometrics*, 2011, 86:39–63.
- [49] H.J. Knight. Patent strategy for researchers and research managers[J]. New York:Wiley, 2001.
- [50] M.E. Moguee, R. Kolar, J. Putnam.Extracting useful information for technology management from international patent records, Small Business Innovative Research (SBIR) Phase I Final Report[J].National Science Foundation, 1992.
- [51] J. Giummo.German employee inventors’ compensation records: A window into the returns to patented inventions[J].*Research Policy* , 2010,39:969–984.
- [52] R Levin, A. Klevorick, R. Nelson, S. Winter.Appropriating the returns from industrial research and development, *Brookings Papers on Economic Activity*[J]. *Microeconomics*, 1987,3 :783-820.
- [53] C.S. Wagner, L. Leydesdorff, Network structure, self-organization, and the growth of international collaboration in science[J].*Research Policy*, 2005,34 (10):1608–1618.
- [54] S. Feld.The Focused Organization of Social Ties[J]. *American Journal of Sociology*, 1981,86:1015–1035.
- [55] M. E. J Newman., S. H. Strogatz, D. J. Watts. Random graph models of social networks[J]. *Proc. Natl. Acad. Sci. USA*, 2002, 99 : 2566–2572.
- [56] S.P. Borgatti, M.G. Everett, L.C. Freeman. Ucinet for windows: software for social network analysis[M]. Harvard: Analytic Technologies, 2002..
- [57] R. R. Blundell, R. Griffith, J. Van Reenen. Dynamic count data models of technological innovation[J].*Econom. J.* 1995,105:333–344.
- [58] L. Freeman. A set of measures of centrality: I. Conceptual clarification[J].*Soc. Networks*, 1979,1: 215–239.
- [59] L. Yin, H. Kretschmer., R. A. Hanneman, Z. Liu. Connection and stratification in research collaboration: An analysis of the COLLNET network[J]. *Information Processing and Management*, 2006,42 :1599–1613.
- [60] J.C. Wang, C.H. Chiang, S.W. Lin. Network structure of innovation: can brokerage or closure predict patent quality? [J]. *Scientometrics*, 2010,84 :735–748.
- [61] M.S. Granovetter.The strength of weak ties[J].*Am. J. Sociol*, 1973,78:1360.
- [62] K. Yamaguchi. The flow of information through social networks: Diagonal - free measures of inefficiency and the structural determinants of inefficiency[J]. *Social Networks*, 1994 ,16:57-86.
- [63] J., Hausman, B. Hall, Z. Griliches. Econometric models for count data with an application to the patents -R&D relationship[J].*Econometrica*, 1984 ,52:909–938.
- [64] R. Sampson. The cost of misaligned governance in R&D alliances[J].*J. Law, Econom., Organ.* 2004,20:484–526.
- [65] C.Y Liu, J.C. Wang.Forecasting the development of the biped robot walking technique in Japan through S-curve model analysis[J].*Scientometrics*, 2010,82 (1) :21–36.

- [66] C. Z. Su, L. Hui. Subject knowledge development and predict: the supply chain management for example[J].Chinese Management Review, 2005,8(3):1-17 (in Chinese) .
- [67] D. N. Gujarati. Basic Econometrics[J]. 3rd ed. McGraw-Hill, NewYork, 1995.
- [68] J. He, M. H. Fallah.Is inventor network structure a predictor of cluster evolution? [J]. Technological forecasting and social change, 2009, 76: 91-106.
- [69] C. Roveda, R. Vecchiato . Foresight and innovation in the context of industrial clusters: The case of some Italian districts[J]. Technological forecasting and social change, 2008, 75 :817-833.
- [70] W.W. Powell, K.W. Koput, L. Smith-Doerr. Interorganizational collaboration and the locus of innovation:networks of learning in biotechnology[J].Administrative Science Quarterly ,1996,41:116–145.
- [71] P. Y. Yang, Y. C. Chang.Academic research commercialization and knowledge production and diffusion: the moderating effects of entrepreneurial commitment[J]. Scientometrics, 2010,83 :403–421.
- [72] J. Marques, J., Caraca, H. Diz. How can university–industry–government interactions change the innovation scenario in Portugal ?—the case of the University of Coimbra[J].Technovation, 2006, 26(4):534–542.
- [73] T. Ratinho, E. Henriques. The role of science parks and business incubators in converging countries: Evidence from Portugal[J].Technovation, 2010:278–290.
- [74] R. Aernoudt. Incubators: tool for entrepreneurship?[J].Small Business Economics, 2004,23 (2) :127–135.

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