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WORLD MARITIME UNIVERSITY

Dalian, China

**Research on the Relationship between China Maritime Safety
Administration and RO for Implementing IMO Member State Audit
Scheme and Relative Path Choice**

By

Zuo Bingtuan

China

A research paper submitted to the World Maritime University in partial
Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

(2013)

DECLARATION

I certify that all the materials in this research paper that are not my own work have been identified, and that no materials are included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

Signature: Zuo Bingtuan (mobile phone:13635238619)

Date: June 30, 2013

Supervised by: Dr Zhang Renping

Professor of Dalian Maritime University

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ABSTRACT

Title: Research on the Relationship between China Maritime Safety Administration and RO for Implementing IMO Member State Audit Scheme and Relative Path Choice

Degree: MSc

The research paper is a study of the game relationship between China MSA and RO for implementing IMO member state audit scheme (IMO MSAS) and relative path choice.

From the perspective of convention-implementation under the framework of IMO MSAS, "Recognized Organizations"(ROs) play a pivotal role in implementing Flag State Obligation acting on behalf of authorizing administrations. In order to guarantee that the ROs could accomplish the survey tasks being assigned with adequate technical, managerial, and research capabilities, each member state has made great efforts in enhancing its performance of authorizing and monitoring ROs complying with national legislation and international instruments such as III Code and RO Code, but unfortunately the results are not satisfying according to the statistics of IMO audit reports and survey market reality.

Therefore, how should China MSA perfect the management and supervision of RO so that the assigned survey could be performed with high quality and efficiency? It will be a troublesome problem with far-reaching influences faced by China. This paper starts from the introduction of IMO MSAS and its relative requirements on RO authorization and oversight, then based on the illustration of China MSA's current authorizing and monitoring arrangement, comprehensively analyzes the non-cooperative game between China MSA and CCS based on Game Theory and their Non-Pareto strategy choices; After that, the paper systematically examines the internal and external factors of China MSA favorable and unfavorable for improving

management and supervision of CCS based on SWOT approach. Finally, based on the advanced practices and lessons of foreign countries, the author puts forward a comprehensive countermeasure project for Chinese administration to perfect its performance in authorizing and monitoring CCS.

Key words: IMO MSAS, China MSA, RO, Game, SWOT, Countermeasures

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LIST OF ABBREVIATIONS

ABS	American Bureau of Shipping
BV	Bureau Veritas
CCS	China Classification Society
DNV	Det Norske Veritas
FSCO	Flag State Control Officer
FSI	Subcommittee on Flag State Implementation
GL	Germanischer Lloyd
GOC	Government of China
IIC	IMO Instrument Implementation Code
IMO	International Maritime Organization
IMO MSAS	IMO Member State Audit Scheme
ISM Code	International Safety Management Code
JG	Japanese Government
KR	The Korean Register of Shipping
LR	Lloyd's Register of Shipping
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MMSAS	Mandatory Member State Audit Scheme
MSAS	Mandatory Member State Audit Scheme
MSA	Maritime Safety Administration
MTO	Ministry of Transport of the People's Republic of China
NGO	Non-Governmental Organization
NK	NIPPON KAIJI KYOKAI
NMD	Norwegian Maritime Directorate
PEST	Political, Economic, Social and Technological
PSC	Port State Control
PSCO	Port State Control Officer

QMS	Quality Management System
RO	Recognized Organization
SBG	Ministry of Transport to the German Seamen's Accident and Prevention Insurance Association
SMS	Safety Management System
SWOT	Strength, Weak, Opportunity, Threat
UNCLOS	United Nations Convention on the Law of the Sea
UN	United Nations
USCG	United States Coastal Guard
VMSAS	Voluntary Member State Audit Scheme

1 Introduction

1.1 Background of the research

In order to ensure the consistent and effective implementation of IMO conventions globally for achieving the common goal of maritime safety and marine environmental protection, in 2006, IMO began to carry out audit scheme to verify each member state has taken all possible actions to give the mandatory instruments full and complete effects. Under the framework of IMO MSAS, convention implementation is a very complicated project as many organizations or interested parties are involved in performing the obligations of flag state, port state and coastal state respectively. Among these parties, ROs working on behalf of flag states play a very significant role in terms of ship survey and certification, which would greatly influence the flag state's convention-implementation ability and image. Therefore, IMO has adopted a series of documents for guiding member states to adequately authorize and monitor ROs, such as Resolution A.739(18) entitled "*Guidelines for the authorization of organizations acting on behalf of the Administration*", as amended by resolution MSC.208(81), and Resolution A.789(19) entitled "*Specifications on the survey and certification functions of recognized organizations acting on behalf of the Administration*", which have become mandatory under chapter XI-1 of the 1974 SOLAS Convention, under chapter I of annex I to annex B of the Protocol of 1988 relating to Load Lines Convention 1966, and under Annex I and Annex II of the MARPOL Convention. Moreover, the III Code and RO Code have both clearly specified as follows:

The flag State should establish or participate in an oversight programme with adequate resources for monitoring of, and communication with, its recognized organizations in order to ensure that its international obligations are fully met.

However, according to the statistics of IMO audit reports involving 26 countries, it is found that RO Problem ranks No. 3 in the Non-conformity and No. 2 in the

Observation, which demonstrates that the flag states universally could not authorize and monitor RO in an efficient and effective manner. In China, due to the special political and technical reasons, there are actually many deficiencies existing in RO authorization and supervision which is also listed as one of the three Non-conformities in the 2009 IMO audit. As the IMO mandatory member state audit scheme(MMSAS) and the mandatory implementation of RO Code coming nearer and nearer , China, as a consecutive Category A member of IMO, should attach great emphasis to proper authorizing and monitoring RO ensuring it delivers high standards of survey service complying with international requirements and national legislation. Therefore, the topic of this dissertation becomes a very urgent agenda with realistic significance for Chinese administration and maritime authority.

1.2 Objective of the research

This dissertation mainly addresses the following questions:

1. What are the requirements of IMO MSAS related to RO authorization, and how about the authorizing and monitoring situation of RO in China currently?
2. How about the game relationship between China MSA and CCS, and what problems are arising from this kind of non-cooperative game?
3. Based on SWOT analysis, how should we dialectically analyze the internal and external factors China MSA faces in managing and monitoring CCS?
4. Based on the good practices of the developed countries, what countermeasures could be taken by China MSA to further improve the management and supervision of CCS?

1.3 Organization of the thesis

The thesis consists of 8 chapters and is organized for the purpose of using Game Theory and SWOT approach to address what kinds of advantages and challenges China MSA has in authorizing and monitoring CCS , and which path it could choose,

if applicable, to perform its consistent oversight of CCS in an efficient and effective manner.

Chapter 1 summarizes the research background, objective, organization, methodology and new ideas of this dissertation;

Chapter 2 firstly introduces the development of IMO MSAS, then in this framework, presents the regulations and requirements of IMO MSAS and RO Code related to RO authorization and oversight, which provides legal basis and guidance for the discussion of this dissertation;

Based on the brief introduction of CCS and China MSA's current authorizing and monitoring arrangement in Chapter 3, Chapter 4 gives in-depth quantitative and qualitative analysis of the non-cooperative game between China MSA and CCS based on Game Theory and their Non-Pareto strategy choices.

Chapter 5 comprehensively expounds the strength, weak, opportunity and threat of China MSA for improving the performance of managing and monitoring CCS based on SWOT approach, and chapter 6 introduces the advanced practices and lessons of ship survey and RO supervision in foreign countries.

Based on the analysis above, chapter 7 puts forward a comprehensive countermeasure project for China MSA in terms of management, technology, team building, legislation, oversight programme to perfect its management and supervision.

Chapter 8 is the conclusion summarizing the whole study.

1.4 Methodology of the research

In order to gather reliable and authentic data and information, the primary methods applied in this dissertation is Literature Review mainly including:

- IMO instruments relating to RO
- Annual survey report of China MSA and CCS including statistics data
- Laws and regulations of ship survey management promulgated by Chinese administration
- Research papers and publication focusing on RO

-- Trustable Internet websites such as IACS

Secondly, in order to get the first-hand materials of RO authorization and supervision in China, investigation and interview are carefully designed and performed. Through the investigation, telephone and face-to-face interview with maritime authorities, CCS branches and ship-owners etc, the current authorizing and monitoring arrangement and the expectations of each party are well understood. In addition, the Contrasting Approach is employed, introducing and comparing the advanced experiences of foreign countries. This dissertation attempts to find out effective measures for China MSA to improve its oversight performance. Moreover, SWOT analysis is used to comprehensively evaluate the elements favorable and unfavorable to CCS monitoring and management. Finally, The Game Theory and Method of Induction in qualitative and quantitative analysis help the author clearly detect the game relationship and strategy choices between two parties and pragmatical countermeasures for China MSA. Tables and Figures are also shown to assist the vivid presentation of this thesis.

1.5 Innovations of the research

Presently the research materials in respect of RO monitoring are quite few. Besides some IMO documents, there are only several papers just confined to the discussion of the necessity and advantages for maritime authorities to delegate survey functions to ROs at home and abroad. Also some papers discuss how RO itself should improve its quality of survey and certification from the perspective of technology. However, there is almost no research, especially in China, on how maritime authorities should manage and monitor RO systematically to improve RO's ability of convention-implementation acting on behalf of administrations. Therefore, the innovations of this dissertation are mainly in the following aspects:

--initiatively expounds how to perfect China MSA's management and supervision of CCS so as to improve its survey and service competence

--puts the topic in the framework of mandatory IMO audit scheme and RO Code, closely connect with the requirements of convention implementation, which makes this dissertation have strong realistic significance.

--initiatively applies the advanced analysis theories and tools into this dissertation, such as Game Theory, Institutional Change Theory, Principal-agent Theory, SWOT analysis, Comparative analysis and Questionnaire investigation etc.

--puts forward suggestions from systematic perspective instead of only technology perspective.

2 Exposition of IMO MSAS Regulations and Requirements on Authorizing and Monitoring RO

2.1 General introduction of IMO MSAS development

Since its inception, IMO has passed more than 40 conventions and protocols, also 800 rules and recommendations, and it has taken series of measures to strengthen and monitor the convention-implementation of Member States. Unfortunately the result is always unsatisfactory. In order to ensure unified and effective implementation of IMO conventions globally for achieving the common goal of maritime safety and marine environmental protection, the IMO Voluntary Member State Audit Scheme(VMSAS) came into being(Li, 2007, p. 40).

In 2005, the IMO 24th Assembly approved the audit procedure and guideline to implement the VMSAS, which provides specific requirements and methodology for the audit. “Framework and Procedures for the Voluntary IMO Member State Audit Scheme” and “Code for the Implementation of Mandatory IMO Instruments” were established in Resolutions.A.974 (24) (IMO, 2005a) and Resolutions.A.973 (24) (IMO, 2005b). In January 2006, IMO formally adopted Voluntary IMO Member State audit Scheme which endowed IMO with the power of auditing and assessing the Member States’ effective implementation and enforcement of relevant international mandatory instruments, and IMO has successfully developed its role from traditional "Rule Maker" to “Implementation Supervisor”(Zhang, 2012a). Figure 1 clearly shows the development progress of VMSAS.

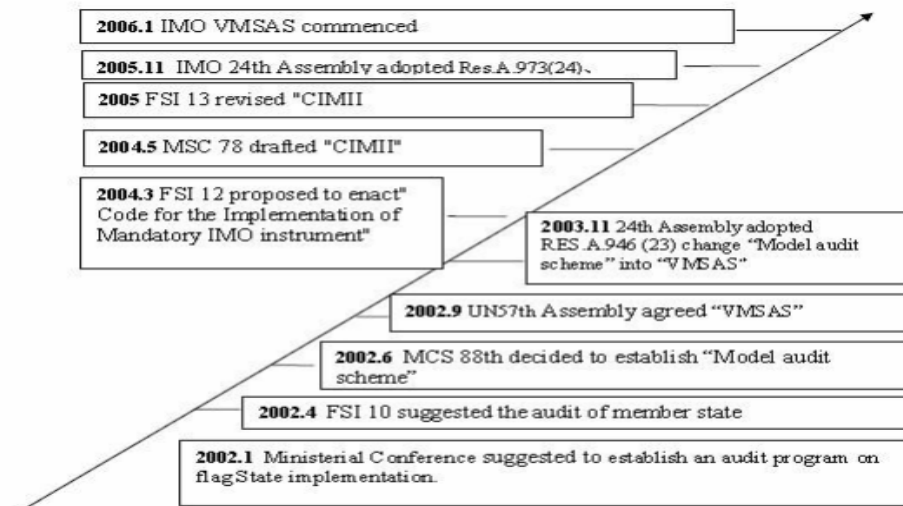


Figure 1: Development of Voluntary IMO Member State Audit Scheme

Source: Zhang, B.(2012). *PEST Approach: A Study on the General Impacts of Implementing Mandatory Member States Audit System for China MSA and Countermeasures*. Unpublished master's research paper, Dalian Maritime University, Dalian, China.

In 2009, IMO Assembly adopted resolution A.1018 (26) at its 26th session, through which IMO audit scheme will develop into an institutionalized, mandatory scheme, and enter into force in January 2015. Figure 2 demonstrates the time schedule of MMSAS.

Timing	Action
Second half of 2011	Council approve a progress report for submission to A 27
November 2011	Assembly 27 will receive a progress report and decide as appropriate
2011-2012	Review the Framework and Procedures for the Scheme (JWG)
First half of 2013	Approve the Framework and Procedures for the Scheme, for submission to A 28 for Adoption (Council)
2013	Adopt amendments to the mandatory IMO instruments concerned for entry into force on 1 January 2015 (Committees)
November 2013	Adopt resolution on the Framework and Procedures for the Scheme and amendments to those mandatory instruments under the purview of the Assembly (Assembly 28)
2014	Preparatory work for the commencement of an institutionalized audit scheme Council, Committees and Secretariat)
2015	commence

Figure2: Time Schedule of IMO Mandatory Member States Audit Scheme

Source: Zhang, B.(2012). *PEST Approach: A Study on the General Impacts of Implementing Mandatory Member States Audit System for China MSA and Countermeasures*. Unpublished master's research paper, Dalian Maritime University, Dalian, China.

2.2 Regulations and legal basis of IMO MSAS for authorizing and monitoring ROs

Under the framework of IMO MSAS, Convention-implementation is a very complicated project as many organizations or interested parties are involved in performing the obligations of flag state, port state and coastal state respectively, as shown in figure 3.

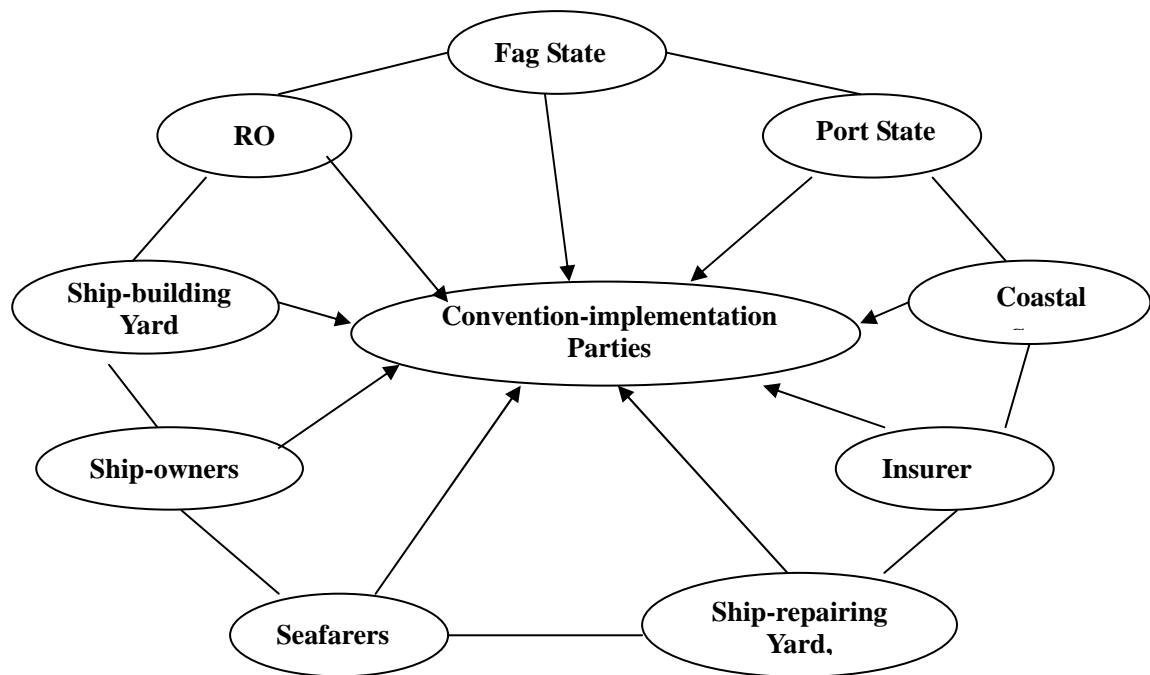


Figure3: Convention-implementation organizations and interested parties of IMO MSAS

Source: Compiled by the author

Among these parties, ROs working on behalf of flag state play a very significant role in terms of ship survey and certification, which would greatly influence the flag state's convention-implementation ability and image(Krilic, 2012). Therefore, the Flag State Part of III Code has clearly stipulated that the flag state should strengthen management and supervision on ROs as follows(IMO, 2011):

Flag States authorizing recognized organizations to act on their behalf in conducting surveys, inspections, the issue of certificates and documents, the marking of ships and other statutory work required under the IMO conventions

*must regulate such authorization in accordance with SOLAS regulation XI-1/1:
Flag States nominating surveyors for the purpose of carrying out surveys and inspections on their behalf should regulate such nominations, as appropriate, in accordance with the guidance provided in paragraph 18,
The flag State should establish or participate in an oversight programme with adequate resources for monitoring of, and communication with, its recognized organizations in order to ensure that its international obligations are fully met.*

Besides that, IMO has also adopted a series of documents prescribing the guidelines and minimum specifications for ROs acting on behalf of the administrations, such as Resolution A.739(18) entitled "Guidelines for the authorization of organizations acting on behalf of the Administration", as amended by resolution MSC.208(81), and Resolution A.789(19) entitled "Specifications on the survey and certification functions of recognized organizations acting on behalf of the Administration", which have become mandatory under chapter XI-1 of the 1974 SOLAS Convention, under chapter I of annex I to annex B of the Protocol of 1988 relating to Load Lines Convention 1966, and under Annex I and Annex II of the MARPOL Convention. All of these provide a solid legal basis for guiding member states to adequately authorize and monitor ROs(Zhang, 2011, pp.12-13). More importantly, in order to gather all the applicant requirements for RO in a single IMO mandatory instruments, IMO has made great efforts in adopting RO Code which provides flag states with a standard for uniformly recognizing, authorizing and monitoring their ROs.

2.3 Main problems of RO found in IMO MSAS

Since the first audit of Denmark in September 2006, IMO has audited more than 50 countries. According to the statistics of 9 Consolidated Summary Audit Report involving 26 countries, it is found that RO Problem ranks No. 3 in the Non-conformity and No. 2 in the Observation, which clearly demonstrates RO

Problem has universality in almost all member states, and the problems mainly lies in the areas of authorization to RO, agreement signed between RO and maritime authorities, and supervision on RO etc(IMO, 2010).

In 2009, the IMO audit team also listed RO Problem as one of the key problems in the aspects of both Non-conformities and Observations when auditing China, indeed, there are many deficiencies existing in China MSA's management and supervision of China Classification Society(CCS) which is the only RO of China maritime authority(IMO, 2009). For example, both China MSA and CCS issue the safe operation certificate to high-speed passenger ship, and illogically the same ship sometimes owns 2 safe operation certificates due to the confused authorization system.

Moreover, the agreement signed by the two parties could not cover all the statutory documents within the delegation scope, no clear regulations have been formulated for sending MSA officers to perform overseas additional survey, and the survey data of CCS are actually not available to China MSA timely etc(IMO, 2009). Therefore, to effectively authorize and monitor RO has really become an impending matter worth researching for all IMO member states.

3 Introduction of China Classification Society and relative Authorization of China MSA

3.1 The development progress of China Classification Society and its organizational attributes

3.1.1 The development progress of China Classification Society and its main functions

The reform of China Water Administration System has greatly changed the ship survey system in 1998, through which CCS split away from China Ship Inspection Bureau and became the only professional organization engaged in ship classification survey business. Although CCS is operated in the enterprise manner, it is still an institutional body directly attached to the Ministry of Transport presently. Its business scope mainly covers classification and notification survey of domestic and foreign ships, offshore installations, containers and related products, and statutory survey delegated by Chinese or foreign administrations, as well as other business approved by relevant authorities(CCS, 2011).

3.1.2 Organizational attributes of CCS: Quasi-Governmental Organization

Quasi-Governmental organization is a non-governmental organization but conferred with social management functions. In accordance with national laws and regulations(or under the authority of the administration), quasi-governmental organization assumes certain management functions of social and public welfare, gives full play to the link between government and society and offers a wide range of services for the community following the principle of independence, open, fairness and justice. Generally speaking, quasi-governmental organization has three basic attributes:

(a) It is non-administrative organization rather than governmental organization, its

members are not national civil servants;

(b) It bears some social management functions;

(c) Its ultimate goal is to pursue public-interest although it has self-interest for survival. The funding source of quasi-governmental organization is very complex with following types: self-supporting, government funding, membership fees and fee-for-service activities. However, sometimes the quasi-governmental organization could not strike a good balance between public-welfare and self-interest especially in the case of loose management and supervision.

CCS is precisely this type of quasi-governmental organization. Obviously, it is not a governmental organization and not in pursuit of self-interest as its basic purpose, but mainly provides social services for public maritime safety(Liu, 2004, p.2). All of its tasks, regardless of classification, statutory or notification survey, are authorized by Chinese government to implement international and national requirements to ensure waterborne transport safety and pollution prevention, which is irreplaceable by other social organizations and well reflects its social management functions as an important technical support agency for national security.

3.2 Reasons for authorizing CCS and relative monitoring arrangement by China MSA

3.2.1 Reasons for authorizing CCS by China MSA and its authorization scope

Article 94 of “1982 United Nations Convention on the Law of the Sea” states that “every state should perform effective jurisdiction and control on the administrative, technical and social matters of ships flying its flag”. In addition, many IMO Conventions stipulate the flag State has the responsibility of taking all necessary measures to ensure that ships flying its flag comply with the relevant provisions of the Conventions. However, for China MSA, to adequately fulfill its convention-implementation duties including statutory survey and certification is really

a heavy burden and its ability is also very limited due to the lack of sufficient technical expertise, human resources and funds. Therefore, China MSA delegates the survey function to CCS are mainly due to following aspects:

Firstly, not all IMO instruments are described in details. When the conventions and regulations are in vague expression, it will be very difficult for China MSA to perform survey independently. As CCS has very detailed and professional classification technical codes, it will be a good choice to recognize CCS and take its classification survey standards as reference for statutory survey. Secondly, China MSA, as a governmental organization, is lack of technical expertise in the aspects of statutory survey and certification. CCS, as the “Maritime Technology Bank” of China MSA and a full member of IACS, is very competent for performing statutory survey with high quality and efficiency. Thirdly, it is impossible for China maritime authorities to control ships only engaged in international voyage and not calling at ports of registry on a regular basis, and the cost will be very high if inspectors are sent overseas for on-site inspection, while CCS has its own advantages thanks to its global network. Finally, it's very beneficial to ship owners, If CCS could be delegated to perform statutory survey, it could reasonably arrange the schedule of classification and statutory survey together for the convenience of ship-owners, also reduce survey cost(Li, 2010, pp. 64-65).

Therefore, pursuant to the *Regulations of the People's Republic of China Governing the Statutory Surveys of Vessels and Offshore Installations* and relevant IMO instruments etc, China MSA delegates the authority to CCS and CCS becomes an important part of China maritime organization chart for convention implementation as shown in figure 4. Presently the authorization scope mainly covers the statutory surveys, audits and certification of ships registered in the People's Republic of China, offshore installations established in the jurisdictional waters of China, ship borne cargo containers owned by enterprises registered in China as well as materials and equipments related to the above-mentioned ships, offshore installations and containers,

in compliance with applicable international conventions and instruments.

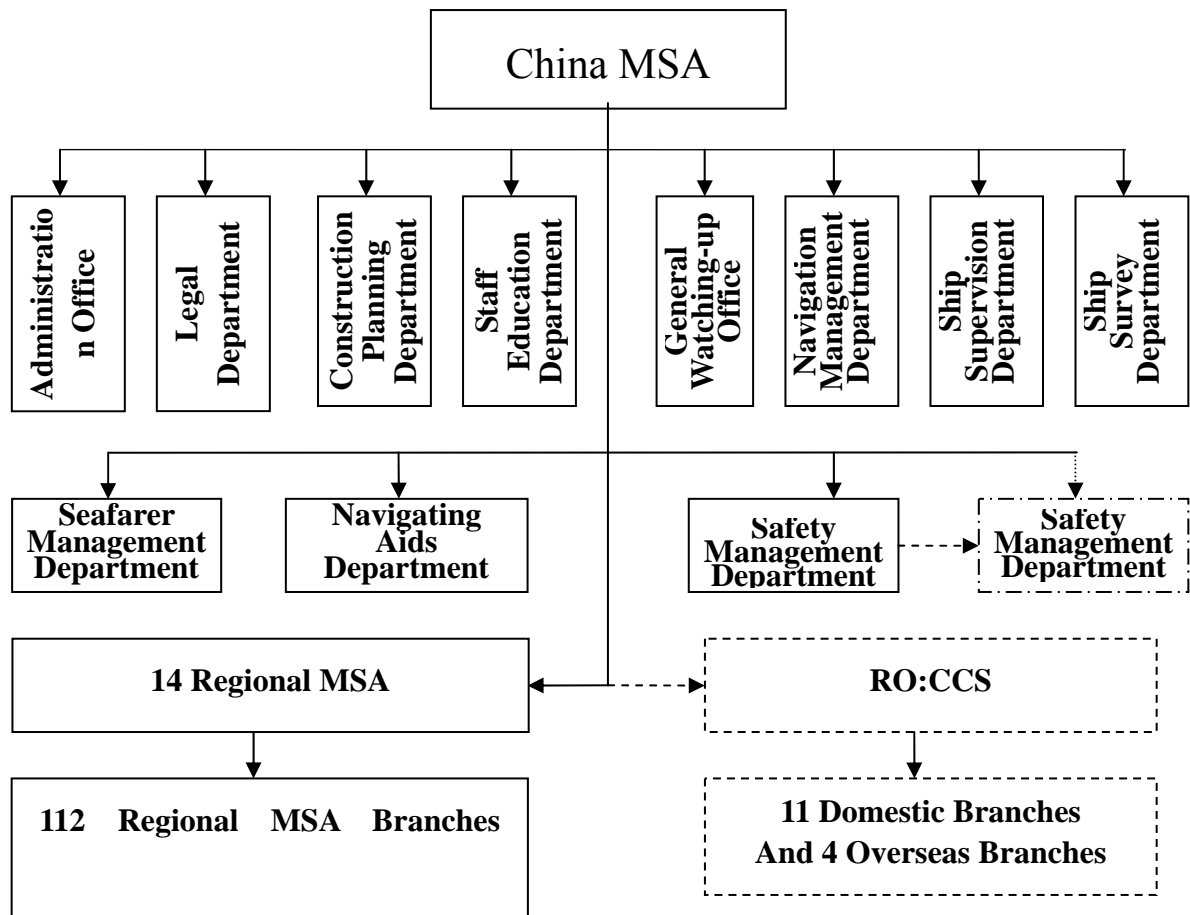


Figure 4: China MSA organizational chart for convention implementation

Source: China MSA(2009). *Summary report on convention-implementation of China MSA*, Beijing: Author

3.2.2 Current management and supervision arrangement of CCS by China MSA

China MSA is the competent authority of ship survey management, and it sets up five survey management offices in Dalian, Tianjin, Shanghai, Guangzhou and Wuhan. Each original MSA also has specified personnel in charge of ship survey management within its jurisdiction. According to the requirements of III Code, China MSA has signed the agreement with CCS and maintained an effective Oversight Programme, and the management and supervision arrangement is mainly performed from the

following three aspects: (a)the formulation and revision of the technical survey codes. (b)qualification management, including qualification verification, delegation, surveyor training, examination and certification. (c)technical supervision and management of ship survey quality.

According to the current management mechanism, China MSA headquarter is directly responsible for the formulation and revision of technical survey codes and standards. The qualification management is uniformly performed by China MSA headquarter with the assistance of the five regional offices, and the headquarter also maintains an annual audit scheme of CCS headquarter and its regional branches. Each regional MSA is in charge of the management and supervision of CCS surveyor competence and survey quality within its jurisdiction respectively. The technical supervision of CCS survey quality mainly includes the following aspects: (a) audit of the implementation of quality management system and track the corrective actions; (b) sample checking of the survey and certification files as well as real ships; (c) investigation of reported cases related to survey quality; (d) further investigation of ship survey quality problems found in FSC, accident investigation and other on-site maritime supervision activities. Moreover, China MSA inspects all sea-going ships twice a year, and pre-departure inspections are jointly conducted by regional MSA safety inspectors and CCS surveyors.

If there are problems or accidents arising from ship survey quality, China MSA will, according to the seriousness level and management division, require the branch office or regional MSA to investigate and handle those problems, or even deal with them on its own.

4 Analysis of the relationship between China MSA and CCS based on Game Theory and their Non-Pareto strategy choices

4.1 Theoretical introduction of Game Theory

4.1.1 Definition of Game Theory

Game Theory is a misnomer for multi-person decision theory, analyzing the decision-making process when there are more than one decision-makers where each agent's payoff possibly depends on the actions taken by other agents. The game process could clearly prove the game relationship is conflict or coordination, competition or cooperation. Usually a formal game includes the following elements: (a)Participants (Players), (b)Action, (c)Information, (d)Strategy, (e)Payment(payoff), (f)Outcome, (g)Equilibrium, among which Participants, Actions and Results are collectively referred to as the game rules, and the purpose of game analysis is to use the game rules to determine the final equilibrium(Zhang, 2009).

In 1944, Von Neumann and Morgenstern published the landmark masterpiece “Game Theory and Economic Behavior” which laid theoretical foundation for Game Theory. Since 1950s, experts such as Nash, Harsanyi and Shapley etc continually promoted Game Theory. Till now, Game Theory, as an important tool of analysis and resolution of conflicts and cooperation, has been widely applied to politics, economics, management science and other disciplines.

4.1.2 Types of Game

4.1.2.1 Static game and dynamic game

According to the action time, game could be divided into static game and dynamic game. The so-called static game means the players take actions at the same time,

even if not, the later player still could not predict what strategic choice the prior actor would make; In contrast, dynamic game means players take actions in sequence, and the later player has clear information of the prior actor's strategic choice.

4.1.2.2 Game with complete information and game with incomplete information

According to the understanding of other players' characteristics, strategic choice, payoff etc, the game could be divided into two types: game with complete information and game with incomplete information. In the game with complete information, each player has a fairly accurate prediction of all other players in terms of characteristics, strategic space, and pay function without uncertainty; otherwise it is game with incomplete information.

4.1.2.3 Cooperative game and non-cooperative game

According to the co-operation between the players, the game can be divided into cooperative game and non-cooperative game. The difference between the two lies in the existence of a binding agreement between the players; otherwise the non-cooperative player violating the agreement will be punished. Modern Game Theory research mainly focuses on non-cooperative game (Wang, 2011). As Table 1 shows, non-cooperative game usually can be divided into four types based on the classification of 4.1.2.1 and 4.1.2.2:

Table 1: Four types of non-cooperative game

Type	Static game	Dynamic game
Complete information	static games with complete information, Nash equilibrium	dynamic games with complete information, Subgame perfect Nash equilibrium
Incomplete information	static games with incomplete information, Bayesian Nash equilibrium	dynamic games with incomplete information, Perfect Bayesian Nash equilibrium

Source: Wang, W.(2011). *Study on the tripartite game relationship in the field of logistics bank business*. Unpublished master's research paper, University of Science and Technology of China, Hefei, China.

4.2 In-depth analysis of the Game relationship between China MSA and CCS

4.2.1 Why apply Game Theory into the research on the relationship between China MSA and CCS

From the view of China MSA, to improve maritime safety and environmental protection is its basic function, which proves its essential nature is in pursuit of public interest as a governmental organization. Without this nature, China MSA will fundamentally lose its legitimacy. However, from the perspective of modern political economy, China MSA is also an interested party of the economic society. In addition to the public benefit, China MSA also has to pursue special political, social and economic interests for its organizational survival and development. Moreover, maritime administration staff also has their own interests. Therefore, it should be clearly kept in mind that China MSA is in pursuit of both public interest and self-interest. From the view of CCS, as a quasi-governmental organization, it is directly attached to the Ministry of Transport but operated in enterprise manner; it has to not only pursue the public welfare of shipping safety, but also economic interest for survival in competitive survey market. More importantly, its staffs are rational individuals in pursuit of their own profit-maximization. Therefore, CCS also has dual-nature of public welfare and self-interest.

The relationship between China MSA and CCS could be understood as similar to “Principal-agent Relationship”¹ with a contract. China MSA is both the principal and manager of CCS, while CCS is the agent and managed objects of China MSA, so the game relationship is formed between China MSA and CCS as two players. In order to protect its own public and self interests, China MSA needs to consider the rational delegation scope and manner, and how to manage and monitor CCS especially constrain its self-interest. CCS has to consider how to achieve greater profits in survey market and the right to speak for its political status` in the Ministry of Transport. Meanwhile it has to accomplish the delegated task of survey and certification with high quality and efficiency. In this contractual relationship, the rational and self-interest oriented actions of the principal and agent would result in the differences in pursuit of goals and information asymmetry, generating the “Risk of Agent and Authorization”²(Epstein, 1989, pp. 105-106). Moreover, CCS and China MSA are two independent departments which are both attached to the Ministry of Transport with almost the same political status, therefore, whether China MSA could effectively intervene and monitor CCS is questionable. Consequently, during the process of authorization and supervision, the intertwined public-interests and self-interests of both parties make the game relationship more complex and full of cooperation and conflict (Wang, 2009). While Game Theory is precisely to solve and find the payoff equilibrium point among the players by analyzing the complex rational actions taken by the players in pursuit of payoff maximization. Using game theory to explore the relationship between China MSA and CCS is still in its infancy, and thus this paper attempts to introduce Game Theory to the study of the relationship between the two parties expecting more reasonable analysis and conclusions. On the

¹ This kind of relationship is usually established by formal agreement. Inherent in the Principal-Agent (P-A) relationship is the understanding that the agent will act for and on behalf of the principal. The agent assumes an obligation of loyalty to the principal that she will follow the principal’s instructions and will neither intentionally nor negligently act improperly in the performance of the act. A principal, in turn, reposes trust in the agent, but supervision is also necessary.

² In order to make principal - agent relationship continues to exist, it is necessary to control the agency risk, eliminate or strictly control the "moral hazard" and "opportunistic behavior", while the most effective way is to establish effective incentive and monitoring mechanisms.

other hand, it will lay the foundation for a more in-depth research in the future.

4.2.2 Analysis of the Game relationship and their strategy choices between China MSA and CCS

It is assumed that both China MSA and CCS have two strategies respectively. For China MSA, it could choose Supervision or Non-performance as its strategy in the game. Hereby Supervision includes but not limited to the following items:

- signing written agreement with CCS completely in conformity with III Code and national requirements.
- active participation in the survey of technical standard-setting
- regular audit of CCS and its surveyors' qualification
- daily supervision on the survey and certification quality
- additional survey etc.

While Non-performance means no active and effective supervision after delegation.

For CCS, it could choose Cheat and Non-performance as its strategy in the game. Hereby Non-performance means honest performance without any cheat. Cheat includes but not limited to the following:

- not equipped with software and hardware resources completely complying with the agreement
- its technical codes and standards not fully meet the requirements of IMO instruments and national legislation
- not perform statutory survey and certification strictly according to its internal management system and external requirements
- not inform MSA of relative information fully, timely or accurately as required.

Based on the definition above, when China MSA chooses the strategy of Supervision to strictly monitor and manage CCS, the cost is assumed as a constant S . In this case, if CCS selects the strategy of Cheat, it will be seized by China MSA and fined A , and

$A > S$. If it choose Non-performance, China MSA would pay S in vain. When China MSA chooses Non-performance which means no supervision and management, if CCS chooses Cheat for self-interest, it will receive payoff of E and Chinese government will lose D . If both parties choose Non-performance which means no supervision and no cheat, the payoff of both parties will be 0 . Due to the incomplete information, technical barriers and other restrictions, it's impossible for China MSA to detect the cheat action of CCS 100% upon its supervision, so the detection probability could be assumed as α . Based on the analysis above, table 2 shows the game matrix between China MSA and CCS, hereby the payoffs for China MSA and CCS are indicated by the numbers in each box, the first one is for China MSA and the second one for CCS:

Table 2: The game matrix between China MSA and CCS

		China Classification Society	
Strategy		Cheat	Non-performance
China MSA	Supervision	$\alpha A - S, -\alpha A$	$-S, 0$
	Non-performance	$-D, E$	$0, 0$

Source: compiled by the author

Therefore, according to this game matrix, the game reaction and relative strategy choice of two players could be analyzed as follows:

If $\alpha A - S \leq -D$, for China MSA, Non-performance would be the better strategy, and the retional CCS will surely take Cheat as its strategy. Finally, the Nash equilibrium³ will be (Non-performance, Cheat).

If $\alpha A - S \geq -D$, this game will become complicated and have different final Nash equilibrium depending on different situations. It could be assumed:

P_1 : representing the supervision probability of China MSA;

³ The Equilibrium called in Game Theory refers to the result caused by combination of most superior strategies taken by all gambling participants motivated by their individual rationality. The so-called Nash Equilibrium refers to the strategic combination, which consists of participants' most superior strategies, i.e., each gambling participant confirms he has chosen the most superior strategy to respond given others' strategy, and anybody has no motivation to break this kind of balance. By now, the external force or special event's occurrence are needed to break this kind of gambling balance.

P_2 : representing the cheat probability of CCS;

U_1 : representing the payoff Function of China MSA;

U_2 : representing the payoff Function of CCS;

Then, the formula could be calculated as following:

$$U_1 = P_1[P_2(\alpha A - S) - (1 - P_2)S]$$

$$U_2 = P_2[-P_1\alpha A + (1 - P_1)E]$$

We could get the first-order partial differential equation as following:

$$\frac{\partial U_1}{\partial P_1} = P_2(\alpha A - S) - (1 - P_2)S = 0$$

$$\frac{\partial U_2}{\partial P_2} = -P_1(\alpha A) + (1 - P_1)E = 0$$

Then, we could get:

$$P_1^* = \frac{E}{\alpha A + E}$$

$$P_2^* = \frac{S}{\alpha A}$$

Therefore:

For CCS, when $P_1^* = P_1$, there is no difference between Cheat and Non-performance;

When $P_1^* < P_1$, the optimum choice is Non-performance; When $P_1^* > P_1$, the optimum choice is Cheat.

for China MSA, when $P_2^* = P_2$, there is no difference between Supervision and

Non-performance; When $P_2^* > P_2$, the optimum choice is Non-performance; When

$P_2^* < P_2$, the optimum choice is Supervision.

All the above is the theoretical analysis of the strategy choices of the two players in different situations. From the perspective of reality, during the actual authorization and supervision, the game between China MSA and CCS always keeps changing in a long time span. In case of lack of effective supervision and punishment mechanism, it is impossible for both parties to always perform honestly

for public welfare without any false implementation or cheat for their own interests (Richard, 1996). If we assume that China MSA is willing to spend huge cost on taking the strategy of Supervision in accordance with the III Code and RO Code, and has a strong detection ability to identify any cheat action, then CCS would honestly perform its work according to the authorization agreement in the framework of cooperative game. However, the actual crux of the problem is China MSA is not willing to and hardly has so many human and financial resources to collect and identify game information. Moreover, the professional technical barriers and special political status greatly restrict the practical oversight capacity of China MSA to find out whether CCS frauds. Therefore, as a rational game player, China MSA often chooses the strategy of Non-performance and falls into the embarrassed situation called "Rational Ignorance"⁴. Responding to the strategy of Non-performance of China MSA, we could conclude the preferred strategy for rational CCS is Cheat or false implementation of the agreement in reality.

From the analysis above in both theory and reality, it could be concluded each rational party would take the self-interest oriented strategy as its optimal choice instead of honest cooperation. In this game, China MSA tends to choose Non-performance or passive supervision without spending huge cost, while CCS chooses Cheat for getting more profits, as this kind of strategy arrangement could at least guarantee the original constant payoff for both parties without additional cost. Finally, the game between China MSA and CCS develops into non-cooperative game, which will bring the "Dilemma of Collective Action"⁵(Li, 2010).

It should be pointed that, if China MSA and CCS could reach a binding agreement

⁴ Because of the high cost of searching for information, no one could or would like to get all the information and knowledge with high investment, on the contrary, people choose to get only a specific part of the information based on cost-benefit analysis, while keep ignorance to other information.. Under this circumstance, the ignorance is regarded as rational ignorance.

⁵ The "Dilemma of Collective Action" is an universal social phenomenon, namely the individual rational non-cooperation strategy leads to collective non-rational behavior, finally falls into Nash Equilibrium. The most three influential models about this public choice are Common Area Tragedy, Prisoners' Dilemma and The Logic of Collective Action. Whatever model narrates that each independent individual is pursuing maximized profit inspired by rationality, and confirms he has chosen the optimum strategy, but the result proves it is the worst strategy for the whole, for causing biggest lost for the public interest and resulting in Common Area Tragedy, finally also brings disaster to each individual.

and guarantee its effective implementation, the Nash Equilibrium caused by the non-cooperation game could be successfully broken, which could push China MSA and CCS to put its self-interests into public maritime welfare honestly and consciously, thus push the Collective Dilemma into Pareto Improvement, thereby achieving Pareto Optimality⁶. The binding agreement and its continual successful implementation mainly depend on the following conditions: (a) the existence of common interests; (b) the amount of transaction and implementation costs; (c) the existence of the external supervision force; (d) the existence of appropriate organizational and administrative arrangements (Wang & Shen, 2007, p.49).

4.3 Problems caused by Non-cooperation game between China MSA and CCS

Since China survey system reform, the non-cooperative game between China MSA and CCS has fallen into “Prisoner's Dilemma” and caused a series of problems. Honestly speaking, China MSA's supervision and management is not in place, and consequently CCS sometimes fails to strictly and effectively perform survey complying with national and international requirements, such as “issue certificates without survey”, “falsify ship age” and “issue tonnage certificate nonconforming with the ship's actual size” etc, which brings huge hidden danger to maritime safety. In 2009, IMO performed voluntary member state audit in China and listed one Non-conformity item and two Observation items related to RO, also pointed out many areas for improvement, as shown in table 3. These problems cover almost every aspect of RO authorization and supervision such as agreement, delegation scope, report and additional survey etc, which well demonstrate the Non-performance of China MSA and the Cheat of CCS in implementing IMO mandatory instruments and national requirements (IMO, 2009). Therefore, it's really the time for China MSA to

⁶ Pareto Optimality is one kind of economic situation raised by Italian economist Pareto. It refers to resources deployment situation with following nature, that is, under certain collective gambling pattern, any gambling participant adopts any strategy which causes to redeploy resource, it will be impossible to enable one person to get profit and not to cause at least one participant to get lost, namely the resources disposition has achieved the most superior state of equilibrium. People usually also call the resources redeployment situation as Pareto improvement, in which at least one participant could get improved, but nobody's condition goes bad, therefore the Pareto Optimality also refers to the resources deployment condition which no longer has Pareto improvement.

rethink how to enhance management and supervision of CCS and make good preparations for mandatory IMO audit in advance.

Table 3: Problems listed in the 2009 IMO voluntary member state audit of China

Items	Specific contents
Non-conformity	the agreement with RO is not fully in compliance with the IMO model agreement, as issuing and approval of all the statutory certificates and documents delegated to RO have not been included in the Annex to the RO agreement.
Observations	no clear criteria for dispatch of its own surveyors overseas to carry out supplementary surveys
	no objective evidence that China MSA has full ready access to the reports on surveys carried out on board ships flying the PRC flag , by the RO
Other problems	no evidence that China MSA has notified IMO of the specific responsibilities and conditions of authority delegated to its RO and there is no information provided on the GISIS
	the agreement with RO is not in line with the model agreement related to exclusive surveyors and auditors use of another organization
	there may be a remote possibility of China MSA intervention on the function of the RO since both parties are organizations functioning under the same Ministry.
	the internal process for monitoring the validity of certificates issued solely by the Administration for ships flying the PRC flag engaged on international voyages is insufficient
	China MSA could not demonstrate how it verifies the expiry date of these certificates or due dates for annual/periodical audits/surveys.

Source: International Maritime Organization(2009). *The final report of 2009 IMO voluntary member state audit of China*, London: Author

5 SWOT Approach: Analysis of the pros and cons of factors affecting the management and supervision of CCS

SWOT analysis (alternatively SWOT Matrix), also known as trend analysis, is developed by management professors from the University of San Francisco in the early 1980s. SWOT analysis is a strategic and structured planning method used to comprehensively evaluate the Strength, Weaknesses, Opportunities, and Threats involved in a project or in a business venture, so that identify the internal and external factors that are favorable and unfavorable to achieve the specified objectives, proactively adjust methods and resources from the strategic and tactical levels, and finally set the goals accurately and pragmatically(WIKIPEDIA, 2013). Concretely speaking, the four letters of SWOT mean as follows:

Strengths: characteristics of the business or project that give it an advantage over others

Weaknesses: characteristics that place the team at a disadvantage relative to others

Opportunities: elements that the project could exploit to its advantage

Threats: elements in the environment that cause trouble for the business or project

Today, SWOT has become a very important tool for generating meaningful information and scientifically setting the objective in various industries. Furthermore, based on the game analysis above, SWOT approach will be employed to detailedly investigate the pros and cons of factors affecting ship survey management in China so as to break the non-cooperative game stated above and put forward pragmatical countermeasures for China MSA to perfect authorizing and monitoring CCS.

5.1 Strength

5.1.1 From the point of regulation building

Based on the international conventions and national survey requirements, in the last

two decades, Ministry of Transport and China MSA have promulgated a series of regulations, provisions and guidelines related to RO in the aspects of technical code development, qualification approval, surveyor competence, accountability and quality management etc, as listed in table 6. The vigorous building of laws and regulations has provided comprehensive legal basis and standards for China MSA authorizing and monitoring CCS.

Table 4: Regulations and guidelines related to RO management promulgated by Ministry of Transport and China MSA

Order	Name	Year
1	Regulations on the Ships and Offshore Facilities Survey of the P.R.C	1993
2	Interim Management Measures of Ship Survey	2000
3	Regulations on the Quality Management of Ship Statutory Survey of the P.R.C	2003
4	Regulations on the Quality Management System Audit and Certification of Ship Statutory Survey of the People's Republic of China	2003
5	Interim Provisions of Registered Surveyor System	2006
6	Implementation Provisions of Registered Surveyor Examination	2007
7	Implementation Guidelines for the Accreditation and Management of Ship Survey Agency of the P.R.C	2008
8	Work Procedure of Supervision and Management of Ship Survey	2008
9	Regulations on the Accountability of Ship Survey Agencies and Surveyors	2008
10	Notice on the Adjustment of Ship Survey Management System of China MSA	2008
11	Rules of the Accreditation and Management of Ship Survey Agency of the P.R.C	2008
12	Notice on Further Adjustment of Ship Survey Management System of China MSA	2010

Source:compiled by the author

5.1.2 From the point of human resource

Since 2005, China MSA has recruited a large number of maritime professionals through national civil servant exam, and the priority is firstly given to officers with seagoing experience. Today, there are five categories of technical surveyors within MSA including ship surveyors, ship inspectors, accident investigators, ISM auditors and seafarer examiners, all of whom should pass the competence test organized by China MSA for acquiring law-enforcing licenses and meet the stipulated requirements on experience. More importantly, since the Registered Ship Surveyor Exam was promulgated in 2007, every year large numbers of MSA officers participate in the exam and get surveyor certificates. Law-enforcement liability system and other related provisions are also established to discipline the behaviors of the staff. Therefore, all of these measures provide a strong technical and moral personnel support for effective supervision and management of CCS.

5.1.3 From the point of management

Based on ISO9000 series, Effective quality management mechanism for maritime administration has been established and operated, which incorporates Management by Objective (MBO), Performance Appraisal, Law-enforcement Inspection, Mechanism for the Assessment of Compliance with Conventions and Mechanism to Regulate Maritime Administrative Activities etc. After years of work, the management of China MSA becomes more and more standardized and efficient. While CCS has also established and operated quality management system according to quality management requirements of IACS which has vigorously promoted its internal standardization and institutionalization. On the basis of the good management, China MSA and CCS signed Agreement on the Statutory Survey and Audit of Chinese Ships, according to which management channels as well as supervision mechanism have been well established.

5.1.4 From the point of organizational construction

Great emphasis has been given to the survey organization arrangement especially in the last decade. Besides the five survey management offices in Dalian, Tianjin, Shanghai, Guangzhou and Wuhan set up by China MSA, regional MSAs also set up special Ship Survey Department to cooperate and coordinate with the five offices. Till now, a national survey management network with sound operation mechanism has been well established, which provides good organizational foundation for effective supervision(China MSA, 2009).

5.2 Weak

5.2.1 From the point of survey standards development

As China MSA has not specifically set up research institution of survey standards, for a long time, it is just only in charge of making the formulation and revision plan of survey regulations and norms, then entrust it to CCS for drafting, finally the finished regulations and norms are submitted to China MSA for review, which is just a mere formality without any essential effectiveness as the Ship Survey Division of China MSA headquarter has only 2-3 professional staff without any technical support. Therefore, it could be judged the initiative of technical standards making actually still rests in the hands of CCS, which makes CCS become both referee and athlete. As CCS is operated in self-financing enterprise manner, surely it will consider its own interests firstly. Moreover, currently China MSA and CCS could not share information due to different systems. When MSA finds problems related to ship survey through on-spot supervision, FSC and accident investigation etc, it can not timely transfer these issues to CCS and could not get timely feedback and solution. Therefore, lack of proper communication makes the development and implementation of technical norms less targeted and effective. All of these lead to the formulation of survey technical codes, which can not make the MSA satisfactory either in the quality

or efficiency, causing negative impact on authorizing and managing CCS(Yu, 2009, pp.44-45).

5.2.2 From the point of technical supervision

Due to the limited professional and technical personnel, China MSA has been always fixing attention on administrative management instead of technical supervision during authorizing and monitoring CCS, and the supervision and restraint mechanisms are also not operated soundly, which makes China MSA have no enough control over the statutory survey and certification of CCS. In the daily supervision, China MSA mostly just takes the form of listening to the report or sampling inspection, which can not guarantee comprehensive and accurate monitoring. According to the statistics of FSC in recent years, there is almost no detention caused by deficiencies related to ship survey quality, which demonstrates the poor knowledge and inspection ability of China MSA in the aspect of ship survey (Tokyo-MOU website, 2012). Another example, the supervision on Tonnage Measurement of Ships must be based on on-site technical supervision instead of mere Tonnage Certificate verification at office. To adequately perform this job requires a lot of professional personnel, however, China MSA currently has neither awareness nor technical ability to perform on-site technical monitoring, thus brings loopholes in technical supervision on tonnage measurement. Just because of the poor technical supervision, some CCS surveyors easily tend to illegally perform survey and certification coupled with poor sense of discipline and the pursuit of self-interest.

5.2.3 From the point of political status

In contrast to the foreign maritime authorities that could powerfully control or affect the survival and profit of ROs, CCS and China MSA belong to the Ministry of Transport with almost the same political status. As a quasi-governmental organization directly attached to Ministry of Transport, economically CCS is

self-support and self-financing, politically its leadership appointments and personnel promotion are directly controlled by the Ministry of Transport instead of China MSA. What's more, When there are disputes arising from China MSA's authorizing and monitoring on CCS, the latter could protect its interests and status through the special political channel of direct appeal and complaint to the Ministry of Transport. Therefore, due to this special administrative arrangement, it's really a tough job for China MSA to powerfully manage, monitor and punish CCS (Hu, 2009, p.73).

5.3 Opportunity

5.3.1 From the point of international environment

Following the increasing voice of environmental protection in the international community, IMO has been continuously adopting a series of Green Ship oriented rules and regulations, such as goal-based new ship construction standards(GBS), common structural rules (CSR), the energy efficiency design index(EEDI) and the new coating standard (PSPC) etc, all of which will exert great impacts on ship design, construction and survey. In order to ensure the implementation of these new standards, IMO also attaches great importance to further strengthening the audit and supervision of Member States for the compliance with new Conventions. Other important international organizations such as IACS, ISO and IEC also keep the same pace with IMO in developing standards and norms, and inevitably this trend will set off a revolutionary upgrade of global shipping industry. Such an upgrade is essentially a new industrial structure adjustment promoted by technology leaders, and its purpose is to re-schedule seating in shipping industry and snatch economic and political right to speak. At this given historical moment, CCS, as an important full member of IACS, in order to maintain market position and profits, must further improve its survey standards system, standardize survey and certification behavior and optimize surveyor team. While China MSA, in order to strengthen China's shipbuilding industry competitiveness and improve maritime image, also should strengthen the supervision, management and guidance on CCS. Therefore, this

international development trend provides golden macro environment for China MSA and CCS to strengthen cooperation and share interests in the competition for right to speak in world shipping industry, also will effectively promote the interaction between China's shipbuilding industry and international rules and practices. More importantly, the approaching MMSAS requires RO to continually improve its convention-implementation ability on behalf of flag State administrations, also the RO Code, which has been adopted by 56th session of MEPC with the resolution of MEPC.237(65) and MEPC.238(65) as well as 92nd session of MSC, further clarifies the responsibilities and authorities of RO, and standardize the flag State's supervision and management of RO in terms of management system, qualification audit, surveyor training, information report etc(IMO, 2013). Therefore, the continual emergence of new international rules and the inevitable trend of mandatory IMO audit provide driving force and legal basis for China MSA to perfect supervision and management of CCS(Wang, 2011).

5.3.2 From the point of national environment

Currently, China is deepening political reform and economic reform for reconstructing governmental functions and promoting social government to good governance. The core concept of the reforms is that the government should give full delegation to the social third sector and quasi-governmental organization to provide high-quality public services or products for taxpayers, while the main functions of government change to regulate and guide the social and market forces to work effectively in a transparent and efficient manner in accordance with the requirements of relevant laws and regulations (Rasmussen, 2013). At present, the Chinese government's practices and awareness become more and more mature in authorizing public management functions to the society and market, the relevant supervisory laws and regulations are also gradually established and operated soundly, the public also has been increasingly becoming cognitive about these kinds of authorized organizations acting on behalf of governments. All of these changes in public

management provide strong domestic policy and public opinion support for China MSA authorizing and monitoring CCS.

5.4 Threat

5.4.1 From the point of politics

Path Dependence⁷ and department interests will greatly hinder the new supervision institutional change. Since the reform of ship survey system in 1998, China MSA and CCS has gradually formed the institutional arrangement related to supervision and management. Based on cost-benefit analysis, this kind of arrangement has already been acceptable to both sides for protecting their departmental interests. With the development of domestic survey and international requirements in recent years, the supervision and management of CCS requires considerable institutional innovation according to the RO Code and III Code, which will be the Compulsory Institution Change⁸, and it will encounter strong Path-dependence barrier due to the Chinese traditional official-oriented and power-oriented political atmosphere. Hereby, the problem lies in whether China MSA has sufficient wishes and adequate resources to carry out the institutional innovation, as well as to what extent CCS could accept that kind of change. On the one hand, China MSA has consumed lots of initial and ancillary costs for designing and adapting to the current supervision mechanism; on the other hand, the new system innovation will bring large amount of costs and risks, and exacerbate the non-cooperative game for damaging the vested interests of both parties. Therefore, the strong Path Dependence and departmental

⁷ It specifically means that, the technology evolution or system change of human society is just similar to the inertia of physics. Once the object enters into a path (whether it is "good" or "bad"), it will depend on such a path. Once people do some of the options and make some arrangement, the inertial force would make this selection constantly self-reinforce, and people can not easily get rid of this kind of confinement. It is Douglas Northrop making the "Path Dependence" theory famous, and he won the Nobel Prize in Economics in 1993 for applying "Path Dependence" theory into successfully explaining the evolution of economic system.

⁸ Institute Change Theory includes active institution change and compulsory institution change considering its main body. Active institution change refers to the spontaneous institution change carried on by the group in response to the profit opportunity brought about by institutional imbalance, it has profit-making, voluntary and gradual characteristics; While the compulsory institution change refers to the change caused by government laws and regulations or other coercive force, while it has characteristics of coercion and benefit ambiguity.

interests would make rational China MSA and CCS confine themselves to the existing supervisory regime, through which they could guarantee the stable vested interests and avoid the costs of institutional change and survey market instability.

5.4.2 From the point of professional talent

The technical human resource of China MSA and CCS falls behind the rapid and regional development of shipping and shipbuilding industry. At present, China is experiencing the transitional period from large shipbuilding country to strong country, and its shipping industry is stably recovering from the global financial crisis. On the one hand, in the past decade, the shipbuilding industry has been developing rapidly and gradually shipbuilding industrial belt has emerged represented by the Shandong Peninsula, the southeast coast and the Yangtze River. The developed shipping center also takes shape by the logistics centers of Yangtze River Delta, Pearl River and the Bohai area. On the other hand, great challenges are imposed on China ship survey by the continual innovative ship type and materials required by IMO new regulations, as well as the industrial self-adjustment and regional transfer of shipbuilding. All of these urgently require CCS to improve its geographical organizational construction and team building to support the rapid and regional development of shipping and shipbuilding industry. In contrast, for CCS with relatively limited surveyors, it's difficult to adapt to the technological progress and development demand of shipbuilding industry in terms of hardware and software investment, technical support and research capabilities. China MSA also could not timely make adequate adjustment of geographical institutional arrangement and technical staff due to the supervision and management resource constraint. Therefore, lack of human resource of China MSA and CCS will further exacerbate the non-cooperative game between the two parties, which in return would increase the difficulty of supervision and management of CCS, and exert negative impact on survey quality (Wang, 2011).

5.4.3 From the point of legislation

There is lack of guidance laws of CCS management and normative documents of the rights and liabilities of CCS in the survey field. The international requirements on RO are dispersed in different mandatory or recommended IMO documents, till now there has not been a complete checklist to verify whether these requirements are effectively and uniformly implemented. Neither international conventions nor national regulations have clarified the code of conduct and liability issues of CCS comprehensively. More importantly, in the legal system of China ship survey, in addition to a small number of administrative rules, most are technical normative documents, yet there is no General Law of Ship Survey which could cover the whole content and work process of survey and certification, and present normative guidance and supervision applicable to the survey of all types of ships(CCS website, 2012). As the supporting comprehensive legal system is not in place, during the transposition of new international conventions into national laws, the drafting and revision of relative regulations and normative documents react very slowly. Therefore, the lack of commanding General Law and lagging legislative work in the field of ship survey cause much trouble to China MSA for authorizing and monitoring CCS.

5.4.4 From the point of market

The domestic increasingly fierce competitive market makes it more troublesome to manage and monitor CCS as it declines to perform survey completely conforming with national and international requirements. China ship survey system is very complex due to the historical and administrative reasons, and there are four categories of ship survey agencies in China presently:

- (a) two maritime ship survey bureaus directly attached to China MSA: Ship Survey Bureau of Guangdong Province and Ship Survey Bureau of Heilongjiang Province
- (b) local ship survey agencies set by the governmental transport authorities of provinces, autonomous regions, or municipalities

(c) China Classification Society

(d) the approved 21 foreign ship survey agencies.

Therefore, survey agencies of various systems co-exist and intertwine together at the same place, and sometimes compete with each other and even cross-exam on the same vessel, which seriously disorders the normal performance of ship survey market. As the shipping market is still in the doldrums, some survey agencies even illegally reduce survey standards and issue certificates to get bigger market share. Take the tonnage measurement as an example, each agency should perform survey by relatively unified norms and standards, but actually different agencies often give different results on the same vessel in terms of tonnage size and equipment configuration etc due to their different understanding of survey technical standards for self-profits. As a result, sometimes one ship ridiculously carries two tonnage certificates, the certificate with smaller tonnage is used for paying fees, while the bigger one is used for cargo loading. Therefore, increasingly fierce competition in ship survey market forces CCS to reluctantly perform ship survey and certification with high quality and stringent standards for its survival and profits in the market, which brings more troubles for China MSA to effectively monitor CCS in compliance with the agreement and RO Code(Yang, 2009, p.30).

5.4.5 From the point of social atmosphere

Public demands on maritime safety and environmental protection are getting higher and higher, and the accountability mechanism of public opinion also becomes increasingly stringent. Today, With the rapid development of the information age and the continuous improvement of material and cultural life, the civil awareness has been greatly awakened and the public unprecedentedly is showing increasing concerning and understanding about safety and pollution issues, especially with the assistance of the Internet. What's more, the accountability intensity is also becoming more and more serious. For shipping as an industry of high risk, sometimes a very slight maritime incident would be exaggerated greatly and spread fast in a short time,

finally exert huge negative impact on maritime authority. Therefore, ship survey, as the most important and first frontline of maritime safety, becomes extremely significant. In this circumstance, the social atmosphere and public accountability pose very big challenge and pressure on China MSA about how to supervise and manage CCS strictly and effectively.

6 Advanced Foreign Practices of Ship Survey and RO Supervision

Due to the impact of natural, economic and technical conditions, the shipbuilding industry still displays distinctive regional characteristics today, also different countries and regions have different practices in terms of ship survey management, authorization and supervision, which is worthy of being discussed and learned for China(Zhang, 2005, pp.22-23).

6.1 Good practices of foreign countries

6.1.1 Asia

(a)Japan. In Japan, there are three ship survey agencies as JG, NK, and JCI. JG (Japanese Government) is called the Maritime Technology Safety Bureau, which is a governmental agency and mainly responsible for statutory survey of passenger ships and other ships over 20 gross tonnage, also supervision and management of national survey performance. NK (NIPPON KAIJI KYOKAI) is the classification society of Japan as non-profit social organization. Its principal activities include classification survey, statutory survey, product testing, system certification and technical consultancy etc. For the ships classified by NK, in addition to a small number of items surveyed by JG, the majority are delegated to NK for survey and certification. JCI is a small ship survey agency belonging to the civil association of public welfare. In addition to passenger ships, the ships below 20 gross tonnage and operating within 12 nautical miles from shore are delegated to JCI for survey and certification. Besides self-financing by charging fees, JCI could also be financially supported by Japanese Government. Japan does not authorize statutory survey to foreign classification societies, while its ships engaged in international voyages are generally required for classification survey. In terms of survey cost, Japanese government is in charge of survey charging standards and financially supports the operation of survey agencies.

(b) South Korea. In South Korea, besides the governmental ship survey management agencies, the Korean Register of Shipping (KR) plays a pivotal role in ship survey and certification, and its technical codes and standards has also become an important reference for the Korean maritime authority in developing its rules and regulations. KR is mainly engaged in ship classification survey, statutory survey, marine facilities survey and related technical services. With the development of the shipbuilding industry in Korea, KR is also becoming more and more influential in international shipping circle.

6.1.2 Europe

(a)United Kingdom. In the UK, the Maritime and Coastguard Agency (MCA) is responsible for the statutory survey of all ships, other survey for non-class ship, and the delegation of statutory survey and standards development. According to the Law of United Kingdom, the Government may authorize approved classification societies to perform statutory survey. In practice, MCA has delegated most of the statutory survey items to classification societies, retaining only a small part to be performed by its own surveyors. Moreover, MCA maintains very close contact with the Lloyd's Register of Shipping (LR) as a reliable technical support.

(b)Germany. In Germany, the statutory survey and management of sea-going ships and inland-water vessels are designated by the Ministry of Transport to the German Seamen's Accident and Prevention Insurance Association (SBG) and Inland Water Ship Survey Agency (SUK) respectively. The two agencies are responsible for the management of domestic ship survey agencies and surveyors, if needed, they also perform survey jointly. In Germany, SBG and SUK actively seek collaboration with the classification societies such as Germanischer Lloyd (GL), research institutions and shipbuilding enterprises etc, and fully utilize the cooperative research achievements as an important basis for the development of technical regulations. What's more, Germany has its distinctive features in surveyor management. The Governmental

surveyors of SBG and SUK could both perform the duties of survey management as civil servant and the actual survey activities. Moreover, the surveyors could only be granted qualified certificates after participating in regular training and passing the exams. Every year they would be graded by practitioners' lives and performance evaluation. The training, audit and certification of domestic survey agencies and surveyors are uniformly managed by the government. Based on the introduction of market competition mechanism, a number of survey agencies and collaborating institutions participate in ship survey and certification, which effectively promotes the continuous improvement of internal management and survey quality of these organizations.

(c)Norway. In Norway, the Norwegian Maritime Directorate (NMD) is responsible for statutory survey and its main functions include the survey and certification of non-class ships, the management of classification society qualification etc. It sets up 6 districts and 19 ship survey stations throughout the country primarily in charge of ship survey and PSC. Norway has no mandatory requirements on ship classification and the statutory survey could be delegated to the approved classification societies including Lloyd's Register of Shipping (LR), Germanischer Lloyd (GL), Det Norske Veritas (DNV), Bureau Veritas (BV), American Bureau of Shipping (ABS). For the Classed ships, the Ministry of Trade and Commerce has authorized classification societies to perform most of the statutory survey items, while retaining a small part surveyed by the NMD.

6.1.3 North America

(a)Canada. In Canada, the maritime authority responsible for statutory survey is Transport Canada Marine, and its survey codes and regulations are developed uniformly by the Ministry of Transport. Any ship with more than 15 gross tonnage or carrying more than 12 passengers must be surveyed and certificated by surveyors of Transport Canada Marine. For ships of less than 15 gross tonnage, maritime

authority just takes the form of random survey without issuing certificates but only signing inspection mark on board. The Canadian Law demonstrates that the governmental surveyors have rights of boarding and inspection at any place and any time. Canada has no mandatory requirements on ship classification and the statutory survey could be delegated to the several approved classification societies only includes LR and ABS etc, while retaining some survey items such as load line survey and passenger ship survey. For the non-class ships including those engaged in international voyage, the statutory survey should be performed by surveyors of Transport Canada Marine. What's more, Transport Canada Marine attaches great importance to the surveyors' competence and almost spends about 500 million Canadian dollars on surveyor training every year.

(b)United States. The United States Coastal Guard (USCG) bears responsibility for ship statutory survey mainly in the following three ways: performing survey by USCG himself, authorizing American Bureau of Shipping (ABS) and handing over to the local Chamber of Shipping. In the United States, the USCG keeps very close relationship with ABS, even stations liaison officers in ABS for information communication. In addition to authorizing ABS to perform statutory survey, the USCG also introduces the technical standards of ABS into its ship survey regulations.

6.2 Foreign lessons to China MSA for authorizing and monitoring CCS

Based on the introduction above, there are indeed some good experiences worth learning to improve the game relationship between China MSA and CCS:

--Maritime authority has its own surveyor team and focuses on national survey system building, which provides strong technical support for performing survey and monitoring the survey quality of classification societies;

--Maritime authority actively utilizes the technical advantages of classification societies, and clarifies the legal responsibilities of both parties, even delegates

statutory survey to several societies for encouraging competition;

--Maritime authority develop its own survey standards or actively participate in the development of technical standards of classification societies, even charging standards, enhance communication with classification societies, so as to control survey quality from the starting point;

--Maritime authority strictly specifies the authorized scope and standards, if necessary, personally perform some statutory survey, and has enough power to check classification societies and other authorized organizations at any time and any place;

--Maritime authority seriously highlights the co-operation with classification societies, research institutes, universities, shipbuilding enterprises etc for the research and development of key ship construction and survey techniques, even stations liaison officers in classification societies to ensure information communication and sharing, and increases support for classification societies;

--The classification Societies are pure social organizations completely out of political system, which greatly facilitate maritime authority's supervision and intervention;

--Great attention are paid to the qualification and competence of surveyors, training and assessment are organized stringently;

--The perfect law system of ship survey provides a solid legal basis for monitoring and managing classification societies, it also helps flag state quickly respond to new IMO instruments.

7 Countermeasures for China MSA to Better Authorize and Monitor CCS

Based on the analysis of the non-cooperative game relationship between China MSA and CCS, together with the problems found in 2009 IMO audit and the advanced experiences of foreign countries, it could be predicted that it will be a systematic and complex project to perfect the management and supervision of CCS. However, as the approaching IMO MMSAS and RO Code would exert far-reaching influences on the convention-implementation ability of ROs acting on behalf of flag states worldwide(Mansell, 2009), it becomes very urgent and significant for Chinese administration to take various kinds of actions from macro-strategic level to micro-technical level to improve the current situation. According to the SWOT analysis, the most prioritized and pragmatical work needed to do is the following:

7.1 System: improve the Agreement and oversight programme based on international and national requirements.

7.1.1 Further perfect the agreement between two parties.

The written agreement between China MSA and CCS is the basis of good supervision and governance. China MSA should, based on the previous agreement and problems found in the 2009 IMO audit, further improve the formal agreement by at least including all the elements in the **appendix 3** according to the standard format of RO Code(IMO, 2013). Especially it should clearly define the requirements of reporting to China MSA, authorization specification from maritime authority to CCS, and the development of rules and/or regulations, which are the three key points influencing the effective management and supervision of CCS in the past decade. Some more elements with Chinese characteristics could be added to the written agreement for facilitating the actual management and supervision, such as the settlement of disputes between the two parties as both are within the same political system. Moreover, the agreement should be revised periodically in line with the changes of international requirements and national survey situation(Jönsson, 2012).

7.1.2 Establish and improve the oversight programme

Firstly, China MSA should perform comprehensive assessment on the survey and service level of CCS to ensure its organization, management system and technical capability commensurate with the type and degree of the statutory certification and services authorized by Chinese government, and it should not be neglected to find out the disadvantages of CCS in performing authorized work. Secondly, according to the assessment above, China MSA should develop, or join in an oversight programme with other flag states for monitoring of, and communication with CCS in order to ensure its authorized obligations are fully met. Based on the *Regulations on the Ships and Offshore Facilities Survey of the P.R.C* and IMO instruments such as III Code and RO Code etc, the oversight programme should clearly stipulate its objectives, frequencies and extent, responsibilities, resources, procedures, implementation and record etc, and its various monitoring activities should inter alia include audits, inspections and audit observations with relative quantitative and qualitative analysis. Thirdly, China MSA should keep review on the effectiveness of oversight programme at appropriate intervals and timely take corrective actions to make the programme more effective and targeted, and the oversight programme review should seriously consider the following aspects:

- .1 results of the quality management system audits performed by CCS itself and third-party organizations;
- .2 previous oversight programme records and feedback from other flag states;
- .3 feedback from CCS and relative interested parties and their evolving needs and expectations;
- .4 possible alternative monitoring activities.

7.2 Management: Promote the management system reform of CCS attached to the Ministry of Transport, and enrich the diversified supervision means of CCS.

7.2.1 Separate CCS from political system

From the analysis above, clearly the special political management system greatly

counteracts China MSA's control and supervision of CCS, which brings about its inadequate performance in implementing international and national requirements. Therefore, it's very urgent to reform the special management system of CCS directly attached to the Ministry of Transport while operated in enterprise manner following the current general trend of Chinese administrative reform. Concretely speaking, for the benefits of the development of shipping economy, maritime safety and public welfare, CCS should be gradually freed from the Ministry of Transport and consciously integrate into market competition as an independent social intermediary organizations, actively participate in survey market competition in line with international practices. CCS should clearly recognize that the political umbrella of attachment to the Ministry of Transport will only hinder its development in the long run. It should develop the market-oriented and international strategy which could truly improve its convention-implementation capabilities and international competitiveness(Yuan, 2001, p.26). When separating CCS from political system, Chinese government and MSA should clearly define the social status, organizational attributes and operation mechanism of CCS, especially the authorizing and monitoring relationship between CCS and China maritime authority, so as to clear the benefits distribution and legal responsibility of each party from the institutional level.

7.2.2 Further enrich the diversified supervision means of CCS

Firstly, China MSA should initiate its internal organizational reform, and establish national research institutions of survey development strategy considering the geographical features of statutory survey, so as to enhance national macro-management and co-ordination of survey agencies. Regional MSAs should set up specified ship survey departments to enhance monitoring the qualification and daily survey quality of CCS branches in any way China MSA deems appropriate, as well as further optimize the cooperation mechanism and clarify responsibility division with the five regional offices directly under China MSA(Hong, 2009, pp.163-164). **Secondly**, China MSA may also enter into a written agreement to participate in

combined monitoring activities with other flag States that have authorizations with CCS provided that the level of detail regarding individual flag State requirements and individual flag State performance is addressed at a level equivalent to an oversight programme conducted by each of the individual flag State. They could jointly design and perform oversight programme and share relevant evaluation information so as to manage and monitor CCS comprehensively and accurately. Moreover, intergovernmental cooperation in establishing common auditing practices is also encouraged. **Thirdly**, it is necessary to introduce the third independent audit agency representing the interests of Chinese Administration (Tohn, 1988, p.66). The flag State may rely upon the audits carried out by an social accredited certification body or equivalent organization consists of ship-owner association, ship-building yards and research institutions etc to objectively evaluate the performance of CCS. **Finally**, it is feasible to establish Ship Survey Management Committee consisting of maritime authorities, transport authorities of local governments, CCS, and other national and foreign survey agencies etc, and cooperatively explore inter-agency survey quality management mechanism in pursuit of mutual help and supervision, so as to perform survey with unified standards and improve the quality of survey service.

7.3 Legislation: enhance laws and regulations construction based on the research of III Code and RO Code

7.3.1 Promulgate relative laws of ship survey

In the field of ship survey, Chinese government has not yet formulated relative laws, and till now the Ship Law also has not been enacted, which makes the stability of ship survey policy significantly poorer than that of Japan and South Korea. Therefore, based on the research of III Code and RO Code, it's extremely significant and urgent to develop laws related to ship and ship survey and guarantee their sound implementation so as to promote the healthy and stable development of China ship survey, which will also surely play a crucial role in the improvement of authorizing

and monitoring CCS(Zhou, 2012). Particularly, the administration should try to improve the liability system of CCS through legislation to determine the reasonable responsibility scope of CCS and clarify the responsibility division between China MSA and CCS. Hereby, two points should be emphasized based on the actual situation in China (China MSA, 2009):

-- In the performance of statutory survey, audit and certification, CCS, its officers, employees and other acting on its behalf are entitled to the same defences and counterclaims as would be available to China MSA, its officers and employees.

-- Within the scope of delegation, CCS will bear no liability incurred when it performs the Agreement with no fault or negligence. Otherwise, China MSA will investigate and affix the liability of CCS.

7.3.2 Further improve regulations related to CCS supervision.

Firstly, the existing relevant laws and regulations of RO supervision should be correspondingly revised in accordance with the requirements of IMO mandatory instruments. For example, “*The Regulations on the Quality Management of Ship Statutory Survey of the P.R.C*” is drafted with large number of ISO9000 standard terminologies and methods, which has many discrepancies with actual survey performance (Yang & Xie, 2000, pp. 166-168). Therefore, based on the requirements of quality management system in RO Code, Revision can be made through simplifying the existing content and increasing the content of vertical contract audit. Secondly, the current applicable system of laws and regulations related to RO management and supervision is very similar to that of other survey agencies management, and the context is not specific and targeted. Actually, this kind of uniform and centralized management approach is not conducive to the performance of international conventions and the improvement of RO capacity. After the entry into force of RO Code, the relative rules and regulations such as “*Regulations on the Ships and Offshore Facilities Survey of the P.R.C*” should be modified timely so as to

perform differentiated management of CCS and other survey agencies. Moreover, it will be a good choice to separate CCS from other survey agencies and establish specialized management and supervision regulations to achieve particular management. Thirdly, it is necessary to study and develop *Guidelines for the RO Code Implementation in China* for facilitating the transposition of international instruments such as RO Code into national legislation and domestic enforcement. Anyhow, the IMO's conventions and regulations such as III Code and RO Code will provide good reference for Chinese administration to establish and revise the system of laws and regulations related to RO management and oversight in terms of strict specifications, rigorous norm system and professional terminology etc. The sound establishment and operation of this system will promote China's ship survey to further keep in line with the international practices, and make the supervision and management of CCS more modern, systematic and international.

7.4 Technology: comprehensively improve technical support for monitoring and managing CCS.

7.4.1 Improve the dominance of China MSA in the development of survey standards

The excessive reliance on CCS in the aspect of technical codes and standards development has greatly restricted China MSA to monitor CCS, and deprived survey agencies of the opportunity to display their technical advantages, which eventually leads to the "Matthew Effect", the strong survey agency getting stronger and the weak weaker(Zhang, 2000, pp.23-24). This kind of phenomenon is completely contrary to the requirements of RO Code, that is, RO should be effectively monitored and all the survey agencies should enjoy the same status in the fair competition. Therefore, China MSA should responsibly take full advantage of its own technical staff to develop survey regulations and technical codes. If entrusting to CCS, China MSA should comprehensively provide guidelines and requirements or specify whether the

Administration's standards go beyond convention requirements in any respect for the regulation making, and invite relevant interested parties such as other ship survey agencies, ship building yards and colleges to actively participate in developing survey rules, procedures and/or regulations. One point should be specially emphasized is that, China MSA could entrust CCS to deal with some vague expressions such as "to the satisfaction of administration" in the conventions, but should give clear and detailed specifications thereof and keep close watch on it (Sha, 2009, p.8). Moreover, it's critically important for maritime authorities to keep monitoring and evaluating the effectiveness and applicability of the technical codes and standards for timely revision.

7.4.2 Enhance MSA technical personnel training

As required by the 5.1.3 of Part 3 of RO Code, the flag State should provide sufficient technical staff who have enriched knowledge of the laws and regulations of the flag State and the ROs and who are available to perform effective oversight of the ROs. Thus, China MSA should vigorously build its own surveyor team by recruiting staff with survey educational background or sea-going experience, or directly introducing professionals from the shipyard or ship design units. Moreover, it's essential to strengthen professional training including theoretical training and on-site practices, and it will be a constructive choice to send technical staff to join in the survey performed by CCS or work in CCS for exchange study. This kind of systematic training surely will prompt maritime technical officers to well grasp survey standards and procedures, which make them adroit at monitoring of and communication with CCS, and greatly improve the oversight capacity of China MSA as a whole.

7.4.3 Enhance dynamic technical supervision

Due to the great mobility of shipping, it is quite difficult for CCS to dynamically check the ship's technical conditions as its statutory survey could not be performed at

anytime. However, MSA could carry out dynamic and comprehensive supervision on ships through ship registration, FSC, accident investigation, visa signature and company SMS audit etc(Zhang, 2012b, p.13). By comparing the results of maritime dynamic inspection and survey assessment of CCS, it will be easy to get the first-hand materials of survey and certification quality of CCS and find out problems, so that effective supervision could be exercised on CCS and its surveyors. Similarly, CCS surveyors could also track the ships' corrective actions of the deficiencies in the Flag State Control Record Book signed by FSC officers during statutory survey, through which a dual-mechanism of bidirectional supervision could be developed, and it will have a positive effect on shipping safety.

7.4.4 Enhance the construction of technical information platform

Firstly, it's very necessary to establish information communication and sharing platform between China MSA and CCS to ensure that MSA has enough access to relative information and data of survey and certification timely, especially the seamless connection between FSC information system and CCS survey system could guarantee the real-time monitoring of survey and certification quality. Secondly, China MSA should actively promote the information construction of statutory survey supervision and management system, certification management system and national survey database, and should also try to establish survey e-government so as to improve the monitoring efficiency and effectiveness of CCS. Thirdly, it's feasible to enhance inter-agency survey information management by establishing a nationwide unified database among all survey agencies, and integrate it into maritime information management system for information-sharing, so that the information management and service level of ship survey could be greatly improved(Feng, 2006, p.1).

7.5 Team building: further improve surveyor's professional and ethical competency.

7.5.1 Strengthen requirements on CCS surveyor entry and training

Firstly, the syllabus of the registered surveyor qualification examination should be adjusted in accordance with the requirements of RO Code, and the exam contents should be further enriched, so that the exam could be more commensurate with the actual work of CCS both in terms of content and form, and the surveyors' ability could be truly tested and improved as well. Secondly, Appendix 1 of RO Code--REQUIREMENTS FOR TRAINING AND QUALIFICATION OF RECOGNIZED ORGANIZATION'S TECHNICAL STAFF has made clear requirements on theoretical training and assessment methods of RO surveyors. As one way of monitoring RO, China MSA could evaluate the training results of CCS through random check of training records or activity test to verify whether the trainees have truly mastered the ability of performing, managing and controlling statutory certification and services in compliance with national and international requirements. Thirdly, according to the *Interim Provisions of Registered Surveyor System*, China MSA has the rights and obligations to train CCS surveyors as CCS performs statutory survey on behalf of Chinese government, which is consistent with the RO Code. Therefore, China MSA may conduct training for CCS mainly in the following aspects:

- .1 personal safety awareness;
- .2 understanding and application of the relevant requirements;
- .3 technical capabilities;
- .4 reporting and communication standards.

In addition, it is noteworthy that China MSA may try on training CCS surveyors and maritime inspectors together, which could strengthen bilateral discussion of the new conventions and regulations, eliminate the differences between two parties in the aspects of ship deficiencies identification and technical standards understanding. In this way, the FSC and statutory Survey could be performed with a unified standard, and it will be very conducive to managing and monitoring CCS, and helpful for the improvement of ship safety management and resources saving(Peng, 2009, pp.65-66).

7.5.2 Enhance the building of professional ethics and accountability system.

Just as required by the paragraph 2.5 of part 2 of III Code:

The RO shall be governed by the principles of ethical behavior, which shall be contained in a Code of Ethics. The Code of Ethics shall recognize the inherent responsibility associated with a delegation of authority to include assurance of adequate performance of services. Integrity and quality of the life of the ship Survey Agencies

Therefore, China MSA should require and verify that CCS should attach greatest importance to build Code of Ethics with the core concept of safety, integrity, responsibility and efficiency, and should actively open survey affairs to society such as critical survey data, charging standards and dynamic information etc via the website so as to receive supervision of the public. Another point that should be noticed is that every key link of the whole process from survey application to certificate issuance should be performed by different personnel to avoid excessive concentration of power. In addition, China MSA should carry out multi-level and multi-form educational activities of professional ethics to improve the ethical behavior of CCS surveyors. What's more, post-survey supervision and external oversight are also extremely significant. China MSA should strengthen communication and exchanges with the shipbuilding enterprises and ship-owners etc, and identifying ethical problems timely through external customer opinions (Chen, 2012, p.3). For survey accident caused by negligent act, omission or ethics failure, the government should severely deal with CCS and its employees according to *Regulations on the Accountability of Ship Survey Agencies and Surveyors* suspend their qualifications or even investigate criminal responsibilities.

8 Conclusion

In the background of the approaching MMSAS and RO Code, the competitive survey market development and the advocacy of building safety and environment-friendly society, it's extremely significant and necessary for China MSA to break the non-cooperative Nash Equilibrium with CCS and improve its oversight performance at least based on the following reasons:

--From an overview of economy, CCS should provide high-quality survey services to its customers as an IACS full member enjoying good reputation and leading position globally;

--From an overview of politics, China MSA is duty-bound to monitor CCS performance for the building of maritime safety and harmonious society advocated by Chinese government;

--From an overview of international community, only good authorization and supervision of CCS could guarantee China's good performance in the IMO mandatory audit and responsible image of convention-implementation.

Facing up to the new era of shipbuilding industry, China MSA should have a clear understanding of the situation as expounded by the SWOT analysis above, and take all possible steps to manage and monitor CCS in an efficient and effective manner, among which political reform, legislation construction and technical support should be always the most key factors worth being addressed. It is possible that some measures presented in this dissertation may not prove as pragmatical as first imagined and may require further refinement, and this paper is not exhaustive nor does it purport to depict a complete picture of fundamentally solving all the problems. Facing the long arduous road to conquer, China MSA has to shoulder the corresponding responsibilities conferred by IMO Conventions and Chinese government, make continual efforts to perfect its delegating and monitoring work by reconstructing sound and cooperative game relationship with CCS, and finally achieve good performance in domestic survey service and international convention implementation.

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The Tokyo Memorandum web site gives further information on courses

(<http://www.tokyo-mou.org>)

The China Classification Society web site gives further information on courses
(<http://www.ccs.org.cn>)

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