

船舶安全管理

Ship Safety Management

(英文版)

主编 刘正江



大连海事大学出版社

船舶安全管理

Ship Safety Management

(英文版)

主 编 刘正江
副主编 范中洲
参 编 卜仁祥
王艳华
张玉喜

大连海事大学出版社

© 刘正江 2013

图书在版编目(CIP)数据

船舶安全管理 = Ship safety management : 英文 / 刘正江主编. —大连 : 大连海事大学出版社, 2013. 9

ISBN 978-7-5632-2915-4

I. ①船… II. ①刘… III. ①船舶航行—交通运输安全—双语教学—高等学校—教材 IV. ①U698

中国版本图书馆 CIP 数据核字(2013)第 218008 号

大连海事大学出版社出版

地址:大连市凌海路1号 邮编:116026 电话:0411-84728394 传真:0411-84727996

<http://www.dmupress.com> E-mail:cbs@dmupress.com

大连日升印刷厂印装

大连海事大学出版社发行

2013年9月第1版

2013年9月第1次印刷

幅面尺寸:185 mm × 260 mm

印张:15.5

字数:281千

出版人:徐华东

责任编辑:席香吉

版式设计:弋雅

封面设计:王艳

责任校对:华云鹏 宋彩霞

ISBN 978-7-5632-2915-4

定价:31.00元

Abstract

This textbook covers various knowledge on ship safety management and it consists of seven chapters. Chapter 1 explains the background, concept, theory and method of ship safety management. Chapter 2 presents international conventions on ship safety management. Chapter 3 exams domestic laws and regulations of ship safety management. Chapter 4 introduces the ship safety administration and superintendence ashore. Chapter 5 and 6 make a full elaboration on shipboard safety management and shipboard contingency plan. Chapter 7 concentrates on the topic of marine casualties and incidents.

This book is to be used as a textbook for the course of ship safety management in nautical colleges, also it could be used by mariner as a general reference, in order to obtain a better understanding of ship safety management whether on board or on shore.

Preface

Ship safety management is everybody's concern on board the ship in order to prevent accidents and to protect the maritime environment. There are a number of books published which deal with all aspects of ship safety management for nautical college students. However, few publications are written in plain, simple language that can be easily understood by nautical college students or cadets who are non-native English speakers. Additionally, many reference textbooks regarding ship safety management are so voluminous that quick assistance and guidance might be difficult to find in certain situations before or even after seafarers go to sea.

This book aims to fill the gap and to help non-native speaking mariners to understand the fundamental knowledge of ship safety management and thus cater for the need of onshore management. This textbook meets the requirements of various IMO most updated conventions.

This textbook was jointly written by Doctor Liu Zhengjiang, Professor of Dalian Maritime University, Capt. Fan Zhongzhou, Professor of Dalian Maritime University, Doctor Bu Renxiang, Associate Professor of Dalian Maritime University, Ms. Wang Yanhua, Associate Professor of Dalian Maritime University, Chief Officer Zhang Yuxi, Lecturer of Dalian Maritime University.

Chapter 1 was written by Mr. Liu Zhengjiang; Chapter 2 was written by Ms. Wang Yanhua and Mr. Zhang Yuxi; Chapter 3 was written by Mr. Fan Zhongzhou and Zhang Yuxi; Chapters 4, 7 were written by Mr. Bu Renxiang; Chapter 5, 6 were written by Mr. Fan Zhongzhou. The whole textbook was modified and finalized by Professor Liu Zhengjiang and Capt. Fan Zhongzhou with the help of Doctor Robert Desrosiers from Texas Maritime Academy in English expression. Our gratitude also goes to Capt. Cui Jianhui from Tian Jin University of Technology and Lecturer Gao Xiaori of Dalian Maritime University, who provided immense information to the birth of this textbook.

Special thanks to Professor Wu Zhaolin who examined and acknowledged this textbook and gave valuable suggestions for the improvement.

Numerous references were consulted in the preparation for this textbook. Thanks to all the authors who gave us so much workable, practical details regarding ship safety management. It is hoped that this textbook will be a reliable companion for seafarers on this specific and broad topic.

Liu Zhengjiang

June 2013

Contents

Chapter 1	Introduction of Ship Safety Management	1
1.1	Background of Ship Safety Management	1
1.2	Concept of Ship Safety Management	2
1.3	Organizations Concerned with Ship Safety Management	5
1.4	Theory and Method of Ship Safety Management	10
Chapter 2	International Conventions on Ship Safety Management	20
2.1	United Nations Convention on the Law of the Sea (UNCLOS)	20
2.2	IMO Conventions and Codes Regarding Maritime Safety	25
2.3	IMO Conventions and Codes in Marine Pollution Prevention	40
2.4	Maritime Labour Convention, 2006 (MLC 2006)	52
Chapter 3	Domestic Laws and Regulations of Ship Safety Management	59
3.1	Laws and Regulations on National Sovereignty	59
3.2	Maritime Traffic Safety Laws and Regulations	63
3.3	Marine Environment Protection Laws and Regulations	72
Chapter 4	Ship Safety Administration and Superintendence Ashore	83
4.1	Ship Registration	83
4.2	Survey, Verification and Certification	85
4.3	Safety Inspection	88
4.4	Safety Management of Traffic	98

Chapter 5 Shipboard Safety Management	105
5.1 Safety, Quality and Environmental Policy	106
5.2 Crew Responsibility	107
5.3 Shipboard Meetings and Training	115
5.4 Shipboard Special and Critical Operations	118
5.5 Control of Non-Conformances, Accidents and Hazardous Situations	121
5.6 Ship Maintenance and Repair Work	122
5.7 Safety Operation Management	126
5.8 Maritime Resource Management	136
5.9 Pollution and Regulations	162
5.10 Ship Security	178
5.11 Statutory and internal audit of ISM	191
Chapter 6 Shipboard Contingency Plan	199
6.1 Guidelines for a Structure of an Integrated System of Contingency Planning for Shipboard Emergencies	199
6.2 Emergency Drills and Organization	210
Chapter 7 Marine Casualties and Incidents	215
7.1 Reports on Marine Casualties and Incidents	215
7.2 Domestic Legislation on Marine Accident Investigation	223
7.3 Streamlined Procedures	226
7.4 The Processing of Civil Disputes	229
References	235

Chapter 1 Introduction of Ship Safety Management

Statistics show that maritime transportation accounts for 92% of Chinese trade volume. As the most economic mode of transportation, waterborne transportation represents a significant portion of domestic cargo movement. However, marine transportation is subject to negative publicity due to environmental damage from intentional and unintentional pollution and accidents. Thus, it is important for the maritime industry workers, in particular shipowners and crew, to understand the role of ship safety management plays in improving safety and reducing pollution to improve the operations and public image of the maritime industry.

This book addresses many aspects of shipboard and company management through an exploration of the methods and practices employed to prevent accidents and decrease their impacts in order to improve the safety of waterway transportation. In addition to providing an in-depth examination of safety management, it will consider the origins and basic theories relating to international and domestic legal regimes.

1.1 Background of Ship Safety Management

The maritime industry's attention to shipboard management was triggered by the frequent occurrence and magnitude of accidents. The International Convention for the Safety of Life at Sea (SOLAS), as an international safety treaty, was passed in 1914 in response to the sinking of the passenger liner *Titanic* that result in the loss of 1,500 lives. The SOLAS Convention, in its successive forms, is generally regarded as the most important of all international treaties concerning the safety of merchant ships.

In the middle of the last century, the enormous growth in the maritime transport of oil and in the size of tankers, the increasing amount of chemicals being carried at sea, and a growing concern for the world's environment as a whole made many States feel that the 1954 Oil Pollution Convention was no longer adequate, despite the various amendments that had been adopted. In 1969, inspired partly by the *Torrey Canyon* disaster of two years previously, the Inter-Governmental Maritime Consultative Organization [IMCO, renamed the International Maritime Organization (IMO)] in 1982, decided to convene an international conference to

adopt a completely new convention, The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78).

Statistically, more than 80% of maritime accidents are related to human error, with the inadequacy of management playing a major role. Realizing that the lack of adequate management is a contributing factor in maritime accidents, the IMO set about to improve maritime management practices. In 1993, the IMO adopted the International Safety Management Code (ISM Code) as Resolution A. 741 (18), entering into force on July 1st, 1998. The ISM Code was incorporated into the SOLAS as Chapter IX, "Management for Safe Operation of Ships." A key element of the ISM Code is the Safety Management System (SMS). The SMS is a documented, methodical approach to safety. It explains how shipowners and ship managers manage safety risks. An SMS details the policies, practices and procedures for operating commercial vessels. Today, the ISM Code provides an international standard for the safety management and operations of ships and for preventing pollution.

Chinese government and maritime industry has always valued ship safety management, embracing the ISM Code through education and enforcement. The safety management practices of Chinese shipping companies have seen significant improvement since the establishment, implementation and maintenance of the Safety Management System (SMS). Complementing commercial efforts, the Chinese education system has also sought improvements in safety management.

From the early 1990s, Chinese maritime universities have organized maritime experts to compile ship safety management textbooks, introduced ship safety management into classrooms through research and analysis of safety management theories and practices, analysed maritime accidents and introduced the regulations and best practices, all in order to improve students' awareness of safety and safety management. Since the introduction in 2001 of the Chinese Ministry of Communication's Chinese Ship Safety Transportation and Pollution Prevention Management Code, maritime safety in China has shown steady improvement. It has been concluded that Chinese waterway transportation safety is becoming gradually better off as the practical source problem of ship safety management is solved.

1.2 Concept of Ship Safety Management

Safety management is "relatively free from danger, risk, or threat of harm, injury, or loss to personnel and/or property, whether caused by deliberately or by accident." There are three points worth noting here. Firstly, safety is not absolute, but a quality which has to be specified and continuously enhanced over given periods as a result of accumulating experience. Secondly, the perception of safety depends on the actual circumstances in a given situation as well as the judgment, competence and experience of those involved. Finally, because these concepts embrace so many factors, the subject has to be dealt with systematically.

The goal of ship safety is to minimize the possibilities of injury to crew, damage to vessel and her cargo, and pollution to marine environment by discharge or leakage from ship, by reducing the risk to an acceptable level.

1.2.1 Meaning of Ship Safety Management

Ship safety management is a process of effectively achieving pre-set safety objects by the crew and ship manager through designing a good shipboard environment. It makes use of management processes such as planning, organizing, implementation and control to mitigate unsafe factors arising from weather, channels, ships, and cargo to prevent accidents, ensure crew and passenger health and safety, and avoid ship generated pollution to achieve safe transportation.

Everyone associated with ship and marine activities appreciates the importance of safety. However, the meaning of safety is not so clear, nor is there unanimous agreement about the most suitable method of assessing ship safety. In general, naval architects and engineers tend to believe that safety is a technological issue and that safety can be achieved by accounting for it in their designs. This belief, unfortunately, is not borne out in practice, and it is in fact unhelpful for advancing our understanding of the subject. For example, designing cars for popular use with every desirable safety feature will not eliminate accidents, a road accident is not caused by the car itself but by the attitude and behaviour of the person behind the driving wheel. It is therefore essential to understand the fundamental basis of safety.

1.2.2 Objective of Ship Safety Management

The objective of ship safety management is to minimize or eliminate safety risk that may be experienced by any ship, crew, environment and organization through compliance with a system designed to identify and mitigate risks through a methodical and organized structure.

1.2.2.1 Human Beings and Ship Safety Management

From the perspective of ship safety management, ships are crewed by seafarers. Traditionally, crew are divided into two classes: officers and ratings. They can be further distinguished by their activities on board: management level, operational level and support level, on deck or in the engine room. The number and qualification of each type of seafarer is determined by the flag state's minimum manning requirements, taking into account the requirements of knowledge, capability and skills obtained through training and certification processes. The international convention which guides the qualification of seafarers is the IMO's Standards of Training, Certification, and Watchkeeping (STCW).

The STCW convention was originally established in 1978. Recognizing the need to address changes in technology and practices, the STCW was updated and amended in 1995 and, most recently, in 2010.

1.2.2.2 Ship

A ship is a complex system that includes the ship itself, its crew and its cargo. In addition to a ship's hull and structural systems, there are also systems that control the movement, communications, position fixing, power system, emergency response, cargo movement, etc.

1.2.2.3 Environment

The ship environment can be divided into the internal environment and the external environment. The internal environment includes the ship's design and layout, vibration and noise, and relationships among crew members. The unhealthiness or deterioration of the internal environment can cause negative effects, for example, fatigue on crew may result in unexpected accidents.

The external environment primarily refers to the ship's operating environment that includes meteorological conditions, approaches and waterways, ports, etc. Meteorological conditions include fog, wind, waves, tides, currents and ices. The approaches and waterways risks arise from shallow water, reef, narrow channels, bends in the channel, bridges, traffic density, etc.

1.2.2.4 Organization

An organization is a social group that distributes tasks for a collective goal. Shipping companies and crew constitute their own organization. It is the responsibility of shipping companies to choose, train, and allocate crew, acquire ships, charter and maintain their ships, route their ships, and stress that onshore management is the prevailing concept of modern management. Ship organizations implement the responsibility of ship safety management, entitling the captain to take the full responsibility with helping the ship safety committee. The Chief Officer and Chief Engineer take care of safety issues within their own departments. As most maritime accidents are contributed by human factors, it is crucial for ship organizations to avoid human errors in sufficient time to prevent accidents.

1.2.3 Characteristics of Ship Safety Management

Even though ship safety management belongs to the regime of management, it has its own characteristics.

1.2.3.1 International

Marine transportation is an internationalized industry; its routes are trans-continental, moreover, the management staffs come from different countries. It is affected by international regulations, norms, and concepts.

1.2.3.2 Regulatory

The past few decades have seen the introduction of more legislation within the shipping industry than almost any period in its history. Existing legislations such as the 1990 Oil Pollu-

tion Act (OPA 90), the ISM Code and the revised Standards of Training, Certification and Watchkeeping (STCW) Convention will almost certainly be followed by new legislation in Europe and other countries.

Ships and their crews have to comply with all these international and domestic laws to fulfil the challenges and opportunities of the shipping industry.

1.2.3.3 Mobility

The mobility of ship management can be characterized as ship's mobility and staff mobility. Ships usually move constantly from one country to another country, from one berth to the next; crews sign on and sign off ships frequently. Mobility not only constitutes a character of ship management, but also brings unstable factors in ships' safety.

1.2.3.4 Risk

Maritime transportation is a high-risk industry as weather and sea conditions are very complicated; when these factors are combined with high-density of ships and high-value cargoes, the consequences will be very serious if accidents happen. This shows the importance of ship safety management.

1.2.4 Guiding Concepts of Ship Safety Management

The guiding ideology of ship safety management focusing on:

- Prevention of accidents;
- Seeking truth from facts;
- Constituting a comprehensive system;
- Continuous and effective implementation of safety procedures;
- Attentive evaluation of human factors;
- Attentive evaluation of technology.

1.3 Organizations Concerned with Ship Safety Management

As mentioned above, maritime transportation has international, regulatory and other characteristics, and the ship safety management organization is involved in all aspects of the industry, including international organizations and foreign authorities such as the UN office for Ocean Affairs and the Law of the Sea, the International Maritime Organization, flag states, port states, coastal states, shipping companies, ships, classification societies and other industrial organizations, all of which play active roles in ship safety management.

1.3.1 UN Office for Ocean Affairs and the Law of the Sea

The United Nations Office for Ocean Affairs and the Law of the Sea is the marine affairs management department of the UN, and also serves as secretariat of the "UNCLOS." It pro-

vides services to contracted parties and provides information, advice and assistance to states and intergovernmental organizations. This office keeps a close watch on all the developments of the relevant conventions, law of the sea, and sends an annual report thereon to the general assembly of the United Nations. It also gives suggestions to the Assembly and other intergovernmental forums.

1.3.2 International Maritime Organization (IMO)

IMO is the only United Nations specialized agency to have its Headquarters in the United Kingdom. It currently has 169 Member States and three Associate Members. Its governing body, the Assembly, meets once every two years. Between sessions, the Council, consisting of 40 Member Governments which was elected by the Assembly, acts as IMO's governing body. IMO has several committees, of which the Maritime Safety Committee (MSC) is the most senior. The Marine Environment Protection Committee (MEPC) was established by the Assembly in November 1973. It is responsible for coordinating the Organization's activities in prevention and control of pollution of the marine environment by ships.

There are a number of sub-committees whose title indicates the subject they deal with: Safety of Navigation (NAV); Radio Communications and Search and Rescue (COMSAR); Standards of Training, Certification and Watchkeeping (STCW); Dangerous Goods, Solid Cargoes and Containers (DSC); Ship Design and Equipment (DE); Fire Protection (FP); Stability and Load Lines and Fishing Vessels Safety (SLF); Flag State Implementation (FSI); and Bulk Liquids and Gases (BLG).

The Legal Committee was originally established to deal with the legal problems arising from the Torrey Canyon accident of 1967, but it was subsequently made a permanent committee. It is responsible for considering any legal matters within the scope of the Organization. The Technical Co-operation Committee is responsible for coordinating the work of the Organization in the provision of technical assistance in maritime field, in particular to developing countries. The Facilitation Committee is responsible for IMO's activities and functions relating to the facilitation of international maritime traffic. These are aimed at reducing the formalities and simplifying the documentation required of ships when entering or leaving ports or other terminals. All the committees of IMO are open to participation by all Member Governments on an equal basis.

The IMO Secretariat is headed by the Secretary-General, who is assisted by a staff of some 300 international civil servants. The Secretary-General is appointed by the Council, with the approval of the Assembly.

1.3.3 International Labour Organization (ILO)

The ILO is the international organization which responsible for drawing up and overseeing international labour standards. It is the only "tripartite" United Nations agency that brings

together representatives of governments, employers and employees to jointly shape policies and programmes promoting Decent Work for all. This unique arrangement gives the ILO an edge in incorporating “real world” knowledge about employment and work.

The main aims of the ILO are to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues.

The Maritime Labour Convention, 2006 (MLC, 2006) was adopted by the International Labour Conference at its 94th (Maritime) Session in February 2006 and it aims to achieve decent work for seafarers and to secure a level playing-field for quality shipowners with strong protection against unfair competition from substandard ships.

1.3.4 Flag State (FS)

The flag state of a commercial vessel is the State under whose laws the vessel is registered or licensed. The flag state has the authority and responsibility to enforce regulations over vessels registered under its flag, including those relating to inspection, certification, and issuance of safety and pollution prevention documents. As a ship operates under the laws of its flag state, these laws are used if the ship is involved in an admiralty case.

1.3.5 Port State

Port State Control (PSC) comes into effect when shipowners, classification societies and flag State administrations have failed to comply with the requirements of the international maritime conventions. Although it is well understood that the ultimate responsibility for implementing conventions is left to flag states, port states are entitled to control foreign ships visiting their own ports to ensure that any deficiencies found are rectified before they are allowed to sail. Port State Control is regarded as measures complementary to the flag state control.

In recent years, the importance of Port State Control has been widely recognized and there has been important movements in various regions towards establishing a harmonized approach to the effective implementation of the control provisions.

1.3.6 Classification Society

A classification society is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures. The society also validates that construction is in accordance with these standards and carries out regular surveys in service to ensure compliance with the standards. To avoid liability, they explicitly take no responsibility for the safety, fitness for purpose, or seaworthiness of the ship. Classification societies set technical rules, confirm that designs and calculations meet these rules, survey ships and structures during the process of construction and commissioning, and periodically survey vessels to ensure that they continue to meet the rules. Classification socie-

ties are also responsible for classing oil platforms, other offshore structures, and submarines. This survey process covers diesel engines, important shipboard pumps and other vital machinery.

Classification surveyors inspect ships to make sure that the ships, their components, and their machinery are built and maintained meet the standards required for their class. Today there are many classification societies, the largest of which are China Classification Society, Det Norske Veritas, Lloyd's Register, Bureau Veritas and the American Bureau of Shipping. Classification societies employ ship surveyors, material engineers, piping engineers, mechanical engineers, chemical engineers and electrical engineers. They often located at ports and in office buildings around the world.

Marine vessels and structures are classified according to the soundness of their structure and design for the purpose of the vessel. The classification rules are designed to ensure an acceptable degree of stability, safety, environmental impact, etc. In particular, classification societies may be authorized to inspect ships, oil rigs, submarines, and other marine structures and issue certificates on behalf of the state under whose flag the ships are registered. In addition to providing classification and certification services, the larger societies also conduct research at their own research facilities in order to improve the effectiveness of their rules and to investigate the safety of new innovations in shipbuilding. There are more than 50 marine classification organizations worldwide.

1.3.7 International Industry Association

The International Industry Association and many other international organizations also attend the International Maritime Organization meetings to assume the relevant technical work roles, and participate in various international maritime conventions, regulations, circulars, resolution and make the work; in contributing to such discussions, they become the most important ship safety management powers after flag states and port states. These organizations are including but not limited to the following.

1.3.7.1 The International Association of Lighthouse Authorities (IALA)

The IALA brings together representatives of the aids to navigation services of more than 80 member countries for technical coordination, information sharing, and coordination of improvements to visual aids to navigation throughout the world. It was established in 1957 to provide a permanent organization to support the goals of the Technical Lighthouse Conferences, which had been convening since 1929. The General Assembly of IALA meets about every 4 years. The Council of 20 members meets twice a year to oversee the on-going programs.

1.3.7.2 The International Hydrographic Organization (IHO)

IHO is the inter-governmental organization representing the hydrographic community. It

holds observer status at the UN and is the recognized competent authority on hydrographic surveying and nautical charting. When referring to hydrography and nautical charting in conventions and similar instruments, it is the IHO standards and specifications that are normally used.

1.3.7.3 International Maritime Satellite Organization (INMARSAT)

Inmarsat is a British satellite telecommunications company, offering global, mobile services. It provides telephonic and data services to users worldwide, via portable or mobile terminals which communicate to ground stations through eleven geostationary telecommunications satellites.

The Global Maritime Distress and Safety System (GMDSS) is an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols used to increase safety and make it easier to rescue distressed ships, boats and aircraft.

GMDSS consists of several systems, some of which are new, but many of which have been in operation for many years. The system is intended to perform the following functions: alerting (including position determination of the unit in distress), search and rescue coordination, locating (homing), maritime safety information broadcasts, general communications, and bridge-to-bridge communications. Specific radio carriage requirements depend upon the ship's area of operation, rather than its tonnage. The system also provides redundant means of distress alerting, and emergency sources of power.

Other international industry associations which closely relate to the ship safety management and play important roles in the ship safety management are: the International Chamber of Shipping (ICS), the International Shipping Federation (ISF), the Baltic and International Maritime Council (BIMCO), International Association of Independent Tanker Owners (INTERTANKO), The International Association of Dry Cargo Shipowners (INTERCARGO), International Transport Workers' Federation (ITF), International Maritime Pilots Association (IMPA), International Protection and Indemnity Associations (P&I Clubs), etc.

1.3.8 Shipping Company

An independent ship management company is geared to provide a totally client-driven service. Sophisticated control systems and communication networks provide owners with information about their vessels at any time. Offering the highest level of ship management service. Shipping management emphasizes safety, pollution prevention and shipboard maintenance at competitive, cost-effective rates. Technical crew administration, vessel inspections and superintendence of projects are all performed by the company's highly skilled professionals who have shipping experience with various owners and many different types of vessels.

1.3.9 Ship

Since the end of the age of sail, a ship has been any large buoyant marine vessel. Ships

are generally distinguished from boats based on size and cargo or passenger capacity. Ships are used on lakes, seas, and rivers for a variety of activities, such as the transport of people or goods, fishing, entertainment, public safety, and warfare. A ship is manned by personnel composed of officers and ratings led by a ship's master, commonly referred to as the captain. As the ship is on first-line of security, any mistake of the crew may cause serious safety consequences or pollution of the environment. The flag state and the company's safety rules can only be effectively implemented by the ship's crew.

1.4 Theory and Method of Ship Safety Management

Ship safety management is the application of management theory on the domain of safety. So, the theory of management science and safety science theory all constituted the basis of ship safety management theory. This commonly used management method can also be applied to safety management of the ship.

1.4.1 A Review of Management Science Theory

Ship safety management is based on the basic theory of management science and safety science theory.

1.4.1.1 Maslow's Hierarchy of Needs

Maslow's hierarchy of needs is a theory in psychology, proposed by Abraham Maslow in his 1943 paper "A Theory of Human Motivation." Maslow subsequently extended the idea to include his observations of humans' innate curiosity. His theories parallel many other theories of human developmental psychology, all of which focus on describing the stages of growth in humans.

Maslow's hierarchy of needs is often portrayed in the shape of a pyramid, with the largest and most fundamental levels of needs at the bottom, and the need for self-actualization at the top. The most fundamental and basic four layers of the pyramid contain what Maslow called "deficiency needs" or "d-needs": esteem, friendship and love, security, and physical needs. With the exception of the most fundamental (physiological) needs, if these "deficiency needs" are not met, the body gives no physical indication but the individual feels anxious and tense. Maslow's theory suggests that the most basic level of needs must be met before the individual will strongly desire (or focus motivation upon) the secondary or higher level needs. Maslow also coined the term Meta-motivation to describe the motivation of people who go beyond the scope of the basic needs and strive for constant betterment. Meta-motivated people are driven by Being Needs (B-needs), instead of deficiency needs (D-needs).

1.4.1.2 Theory X and Theory Y

Theory X and Theory Y are theories of human motivation created and developed by