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„A Compliance Evaluation Framework for Business Process Modelling – case Deontic Logic "

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Zusammenfassung

Der Begriff ‘Compliance’ und seine wichtige Funktion in unserer realen Finanzwelt steigert stetig seinen Wert und Unabhängigkeit. Die Verantwortung, die alle Unternehmen tragen mit dem Ziel die Bedürfnisse ihrer Kunden gemäß verschiedenen Vorschriften, Gesetzen und Pflichten zur erfüllen, ist in ihrer Compliance-Abteilung vorgeschrieben. Es gibt unterschiedliche Compliance-Ansätze und Geschäftsmodelle. Jedes Finanzinstitut hat das Ziel das beste Geschäftsmodell für seine Bedürfnisse vorzustellen, dieses zu optimieren und die Regeln des Compliance-Umfelds zu berücksichtigen.

Deontic Logic ist ein Teil der Logikwelt welcher die unterschiedlichen normativen Schlussfolgerungen, Prozesse und Ausdrücke als Erlaubnis/Genehmigung, Verpflichtung und Verbot beschrieben werden. Diese formale Logik stellt verschiedene Ziele und Normen in einer systematischen und klaren Sequenz dar, nach ihren eigenen logischen Regeln. Deontic Logic als Teil der symbolischen Logik, lässt sich mit Symbolen darstellen und ist sehr häufig in Prozessen involviert, die mit Organisationen im Bereich Finanzen, Recht oder Sicherheitssysteme verbunden sind. ‚Business Process Modelling Notation‘ ist eine Darstellung der Geschäftsprozesse in einem Geschäftsprozessmodell. Die Kombination mit Deontic Logic stellt das Deontic Business Process Modelling-Notation vor, die viele Vorteile hat wie Verringerung der Bearbeitungszeit, schnellere Entscheidungsfindung und klare Definition der Arbeitsschritte.

Die BPMN-Notation repräsentiert die Compliance-Prüfung von Geschäftsprozessen und ihr effektivster Einsatz in Design bzw. Prozessoptimierung mit allen dazugehörigen Normen und Regeln und beschreibt diese mit klarer Logik mit geringem Zeit- und Ressourcenaufwand. Dieses Modell zeigt, wie das Compliance-Prozess-Modell in unterschiedlichen Finanzinstituten in Abhängigkeit von ihren regulatorischen Vorgaben und derzeit sehr strikten und sorgfältigen Arbeitsweise optimiert werden kann.

Abstract

The notion of Compliance has an important place in the real corporate and financial world, and its importance increases by the day. The responsibilities borne by the companies in meeting the needs of their clients, while observing the different rules, laws and regulations, are contained and described in their Compliance Departments. There are various compliance approaches and business process models. The aim of any financial institution is to find the business model that best suits its needs, to optimize it, and bring it in line with the compliance environment.

Deontic Logic is a philosophical approach where normative conclusions, processes and expressions are described in terms of permissions, obligations and prohibitions. This formal system of logic represents the different goals and norms as a systematic and clear sequence, which follows its own logical rules. The Deontic Logic, as part of the symbolic logic, expresses itself with symbols and is very often employed in the processes of organizations that are involved in the fields of finance, law, or security. Business Process Modelling Notation is the representation of different business processes in one business process model. The combination of the latter and the Deontic Logic brings us to the Deontic Business Process Modelling Notation (DBPMN) which has a lot of advantages such as decreasing the processing time, limiting the number of decision-taking steps during the process, and providing a clear description of those steps.

The DBPMN represents the process of compliance verification and its structure in the most effective way in terms of design, process steps, inclusion of all rules and regulations, clear and logical description thereof, and saving time and resources. It shows how the compliance process model in different financial institutions can be optimized in line with their respective regulatory environments, and ensures strictness and prudency in everyday operations.

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CHAPTER 1: INTRODUCTION

1. Structure and notes on the text

Apart from the structural elements of the text such as content overview, list of abbreviations, overview of figures and tables, etc., a couple of additional features have been used.

Literature references are given at the end of sentences, in square brackets. Each reference indicates the name of the author and the year of publication. If there are two authors, both names are given, separated by a semicolon. If there are more than two authors, only the name of the first author is given, followed by 'et.al.'. In all cases, the author/s names are followed by the year of publication.

In cases where several different literature sources are referred to, all of them are given in one set of square brackets, separated by commas and followed by the year of publication.

Footnotes have also been used for further clarification of the contents of sections. Those are numbered continuously and placed at the end of each sentence they belong to, and can be found at the bottom of the page to which they refer.

CHAPTER 2: COMPLIANCE MANAGEMENT

Compliance must be part of the structure of any organization

1. What compliance means

The term 'Compliance' implies the ability to conduct business as required by laws, sets of rules, or requirements. It includes the transition from a rules-based approach to another, more accurate and the same time more flexible set of conduct and ethical standards. The compliance function is important to all companies, and especially to financial institutions around the world.

In the Basel Committee document "Compliance and compliance function in banks", published in April 2005, "compliance risk" is defined as "the risk of legal or regulatory sanctions, material financial loss, or loss to reputation a bank may suffer as a result of its failure to comply with laws, regulations, rules, related self-regulatory organization standards, and codes of conduct applicable to its banking activities".[1]

Financial intermediaries should conduct their operations with a view to protecting clients' interests, and helping preserve the market's integrity. They must closely observe the regulatory provisions of the jurisdiction in which they operate. Compliance with the existing laws, regulations and standards is an indispensable part of the fair and orderly functioning of the markets, and the protection of clients. It is imperative that firms develop a business culture which not only enforces observance of laws and regulations, but also promotes high standards of ethics and client protection.

The compliance function is one of the basic pillars of sound corporate governance. Its framework, key components and organizational structure are outlined in the Basel Committee's Guidelines "Corporate governance principles of the banks", last version dated July 2015. As per these Guidelines: "The compliance function should advice the board and senior management on the bank's compliance with applicable laws, rules and standards and keep them informed of developments in the area. It should also help educate staff about compliance issues, act as a contact point within the bank for compliance quires from staff members and provide guidance to staff on the appropriate implementation of applicable laws, rules and standards in the form of policies and procedures and other documents such as compliance manuals, internal codes of conduct and practice guidelines". [Basel Committee (2015), "Corporate governance principles of the banks", Principle 9: Compliance, page 31, point 135].

[1] The Basel Committee on Banking Supervision (the Basel Committee) has been functioning since 1974. Its recommendations, guidelines, international standards have a great impact on banking industry. The Basel Committee was established by the Governors of the central banks of the Group of Ten. Its efforts contribute to the cooperation and the development of the quality of supervision. The meetings of the Basel Committee usually take place in the Bank for International Settlements, which is located in Basel, Switzerland.

2. What is compliance development driven by

The reasons behind most financial crises and related public scandals involve systematic breaches of regulations, failure to comply with regulatory or financial reporting requirements, instances of tax evasion, and tolerating illegal conduct.

During the 1990s, a strong 'bull market' was observed in the US, as both the NASDAQ and the Dow Jones Industrial Average[2] indices rocketed to historical highs. Such rise in market value (which was fuelled by the pursuit of profit) caused some second thoughts in both regulators and sober investors. A series of high profile corporate scandals followed and a dramatic loss of trust emerged. As it turned out, the turmoil was underpinned by widespread cases of fraud, conflict of interest, unequal treatment, and by a massive failure of regulatory bodies and ones charged with protecting public interest to perform their duties. The steps undertaken in response included the "Sarbanes-Oxley Act" accepted by the U.S. Congress in 2002, which charged corporate boards and senior management with the overall responsibility for accountability. The amendments to the U.S. Federal Sentencing Guidelines of 2004 also stimulated stakeholders to promote organizational culture encouraging ethical conduct, and created incentives for greater commitment to compliance.

In 2007, when the global economic crisis struck following the failures in world global financial industry, millions of people lost their jobs and the world witnessed a massive decline in the price of global equities. In the wake of it, the meltdown exposed enormous counts of cases of corruption, of price-fixing, insider trading, of laundering of money, fraud and also different conflicts of interest.

The evolving requirements, standards and guidelines, and the increasing complexity of business posed new challenges, while regulations which were further augmented by the tightening of regulatory supervision. Local and international regulatory bodies responded to the aftermath of the crisis by issuing a series of new requirements and rules, introducing more stringent requirements, and comprehensively auditing their observance. Examples of that were the new consumer-protection regulations and rules which were introduced by the "Dodd-Frank Act" in the US, and also by the EU-wide rules. The US "Foreign Account Tax Compliance Act" (FATCA) passed in 2010, had practically global enforceability as of July, 2014. FATCA required all financial institutions around the world to submit to the IRS information related to the accounts and financial assets held by U.S. persons. FATCA concerns the compliance with tax legislation obligations of U.S. persons.

The first edition of the Basel Committee's document "Principles for enhancing corporate governance" was published in 2010. These principles represent the Committee's effort to provide guidance to banks on sound corporate practices, and on their responsibility to comply with regulations. The document was inspired by both the needs of measures to be taken, and of lessons to be learned from the crisis. The document has been revised since, and the last version "Corporate governance principles for banks" has been published in July 2015.

[2] The Dow Jones Industrial Average (DJIA) is an index that shows how 30 large publicly owned companies based in the United States have traded during a standard trading session in the stock market.

The new EU regulations are still facing a number of challenges. The Basel III recommendations, which have been transposed in specific banking laws and regulations (such as Regulation (EU) 575/2013 include requirements for all kinds of different credit institutions and different investment firms, and are more stringent to banking institutions, especially where the process of assessment of capital adequacy and liquidity is concerned. The new EU requirements concerning financial institutions were introduced in 2014 by the "Directive on the Recovery and Resolution of Credit Institutions and Investment Firms" (BRRD). Many other important regulations with specific importance to the banking union were approved by the EU Parliament and the Council. For example, the Updated regulations and rules focusing on markets in all kinds of financial instruments, known as MiFID II, introduce a market structure that addresses certain shortcomings and provides for trading taking place, wherever possible, on regulated platforms. Within two years, the EU Member States will have to transpose into their legislations the new rules of the recast "Directive on Deposit Guarantee Schemes (DGS)", which comes into force starting with January 2017 and aims to further strengthen depositors' protection in case of bank failures. The Single Rulebook for the banks of the 28 Member States was built with the key involvement of the European Banking Authority (EBA). The Single Rulebook contains a number of Binding Technical Standards (BTS) for implementation of the CRD IV package. The BTS are legal norms which address specific aspects of an EU piece of legislation (Directive or Regulation) and aim at guaranteeing consistency of harmonization in particular areas.

These tighter regulations have proven onerous to many companies which have faced difficulties in introducing proper compliance. Even in cases where such companies have operated for a long time without any significant problems, the stricter requirements have revealed certain loopholes and shortcomings in their accounting systems. Some of them have managed to reorganize on their own, while others have outsourced the compliance effort to specialized firms.

The implementation of country-specific laws and regulations, while observing the European Commission's laws and directives and following the guidelines of the Basel Committee, has called for development and adaption efforts. The new regulations are aimed at better understanding and correct assessment of the risks associated with the growth of financial institutions, and at increasing the trust in banks on the part of the customers and the society as a whole. [10]

Compliance-related laws, rules and standards usually cover areas such as introducing adequate market conduct standards, equitable treatment of customers, avoiding conflicts of interest, and ensuring adequacy of customer advice. Also, they typically involve specific topics such as measures against money laundering and terrorist financing, financial misreporting or misconduct, corruption, bribery, anti-competitive practices, and are consistent with the tax legislation relating to banking products and services, or to ensuring protection of customer data.

Such laws, regulations and standards may have various sources. They may be derived from primary legislation, from rulings and standards of legislative or supervisory bodies, from industry conventions, from codes of conduct promoted by associations, or from the internal codes of an organization applicable to its staff members. They often reach beyond the purely legal requirements, involving a broader scope of ethical and integrity standards. [1],[2]

A firm's activities may have cross-border implications. The Basel recommendations recognize that a financial institution may choose to pursue business in different jurisdictions, with varying legislative and regulatory frameworks. In such cases, compliance efforts will

also depend on the profile of the company (or the group), its legal status and operations in a given jurisdiction. Banks with operations in different countries have an obligation to comply with national legislations. Compliance management has to be implemented in accordance with the business model, risk profile, size and structure of the bank, the principles for good corporate governance, and the applicable legislation of the respective country. [1]

Compliance risk is the risk of losses affecting a company's profits or capital, or its reputation, resulting from breaches of compliance with the active legislation, effective rules and applicable standards. Companies failing to comply with the applicable standards may be subject to fines, payment of damages, or invalidation of contracts. This in turn may lead to damaging of reputation, limiting business opportunities, decrease in the value of assets, and reduction in the potential for expansion. In extreme cases, the company may be rendered incapable of meeting its obligations.

[2],[3]

3. Organizational structure and role of the compliance function

Specialized Compliance Departments appeared in the early 1960s. Prior to that period, the legal departments were usually responsible for performing the compliance function. Compliance Departments are separate units that focus on the conformity of internal rules and procedures to current legislation.

The role of Compliance Departments has become increasingly important over recent years. Their employees have specific qualifications and provide support to business units with respect to compliance of daily operations with the applicable legislative network. They also monitor the internal processes and the conduct of employees with a view to identifying and addressing any shortcomings that may occur. While Compliance Departments are non-business functions, they have a very important monitoring and advisory role within the company's compliance system. At the same time, Compliance Departments do not have supervisory competences such as those of the Internal Audit.

The structure and role of any Compliance Department should correspond to the type of business of the particular company, and to its size. It should be in close communication, and even share some responsibilities, with the other functions in the firm such as the Internal Audit, Risk Management, or the Legal Department.

Figure 1: Compliance function [own source]

Over recent years, a number of institutions have become increasingly aware of the importance of compliance as a vital aspect of their operations. National supervisory authorities have initiated new regulations and requirements to banks, aimed at better performance of their compliance and corporate governance functions. The Basel Committee, with its "Corporate governance principles for banks", has established a new risk-based approach to these functions, referred to as the "three lines of defense":

- The first lines of defense are the business units. As the front line of risk taking, business units are responsible for management of risks, including identifying, assessing and reporting according to the legislative and internal rules, limits and procedures of the bank.
- The Risk Management function and the Compliance function comprise the second line of defense, functioning independently from the business units. The risk function identifies the risks, monitors and estimates their impact on the bank's results, and periodically reports to the Board or to the respective Board Committee. The compliance function monitors and controls the compliance of internal bank regulations with laws, regulations and prescribed good practices, and also reports to the respective competent body.
- The Internal Audit function comprises the third line of defense. It has independent audit authority within the bank and is separated not only from the business units, but also from the second line of defense (the risk and compliance functions). The Internal Audit function, with it risk-based approach, provides assurance to the Board that all systems in the bank, including corporate governance and risk management, are well structured and in place, and are performing their monitoring and managerial functions.

The control functions are independent from the operational business units monitored and controlled by them, as well as organizationally independent from one another insofar as they perform different functions.

Independence from business operations and activities is of particular importance. Compliance

Departments may be subordinated to the Board of Directors, the Risk Department, or directly to the CRO or CEO. Furthermore, they may act in a centralized manner, or at the functional line/business unit level.

The Compliance Department should actively participate in the process of creation of new products or services. The involvement and expertise of compliance officers in the early stages of the process, their advice on applicable laws and regulations as well as on effective techniques for monitoring, facilitate the efforts before the implementation stage of a new product or service. The processes of controlling and resolving conflicts of interest could also be assisted by the Compliance Department.

Compliance responsibilities are not necessarily the function of a dedicated Compliance Department or unit. They may be exercised by the staff in various different business lines itself. The legal department could carry out the responsibilities of advising the Board and the senior management, and educate the entire staff of the company on applicable legislation. In some banks, the process of monitoring the compliance of procedures, products and services with current legislation is within the scope of the legal department activities, but it could also be the responsibility of the Risk Management department. This depends on the size and the business model, as well as on the risk profile of the bank. As far as a division of functions between departments exists, the responsibilities of each department should be clearly defined. There should also be effective mechanisms in place for interaction between departments (e.g. with respect to provision of advice and exchange of relevant information). Such mechanisms should provide for the ability of the Chief Compliance Officer (CCO) to effectively perform his or her duties.

A bank needs to organize its compliance function and determine its compliance risk management priorities in a way consistent with the overall risk management strategy and the relevant internal structures. Some banks, for instance, may choose to place their Compliance Department within the operational risk function due to the close relationship between the two.

Recently banks increasingly prefer to maintain a structure with a separate Compliance Department but, insofar as compliance matters are connected to operational risk, these two functions need to maintain close collaboration.

[2],[4],[5]

4. Compliance functions and responsibilities

The contemporary role of compliance is not limited to following the latest developments in laws and regulations. It also involves a broader and integrated view on industry standards and requirements, increasingly focusing on the evolving standards, internal business and ethical principles, reputational and operational risks. This also includes the requirements for transparency, quality and control of corporate governance, management reporting, IT infrastructure, etc. Particularly in banking, breaches of rules or regulations which were before viewed as employees' personal responsibility, are now increasingly regarded as compliance failures.

The compliance responsibility and functions are established as a safeguard against the risk of any non-compliance, determined by the Basel Committees as the "risk of legal sanctions and financial losses or loss of reputation, that the bank could incur as the result of the failure to comply with laws, rules, self-regulation standards and codes of behavior that are applicable to banking activities" (Basel Committee, 2005). It is obvious that such risk comprises a variety

of categories, including elements of legal risk, as well as of operational and reputational risk.

Nowadays, compliance functions perform the following key roles:

- Ensuring observance of all relevant laws and regulations, as well as of internal rules and policies.
- Identifying compliance risks related to each business line or process; providing guidance to operational units; proposing measures for mitigation of compliance risks.
- Analysis of compliance risks associated with new products and processes, and suggesting measures on appropriate risk mitigation.
- Managing the consistency of all bank internal policies and guidelines with external authority regulations.
- Serving as a point of reference for bank employees when seeking clarifications on legal and regulatory guidelines.

As explained in McKinsey's "Working Papers on Risk Compliance and Control 2.0", the most critical areas of banking control and compliance can be found in marketing and sales, accounting, IT and data security, finance and risk management.

Common key challenges include:

- A number of new rules and regulations, lack of modern and systematic approach. There is a considerable need for prioritization of issues, and planning of investments in different compliance solutions;
- System inefficiencies arising from uncoordinated compliance efforts;
- Focus on development that is reactive, rather than proactive; compliance not responding to strategy; insufficient focus on the regulatory environment. Compliance management should be developed into a profit center, rather than a cost center.

[8],[9]

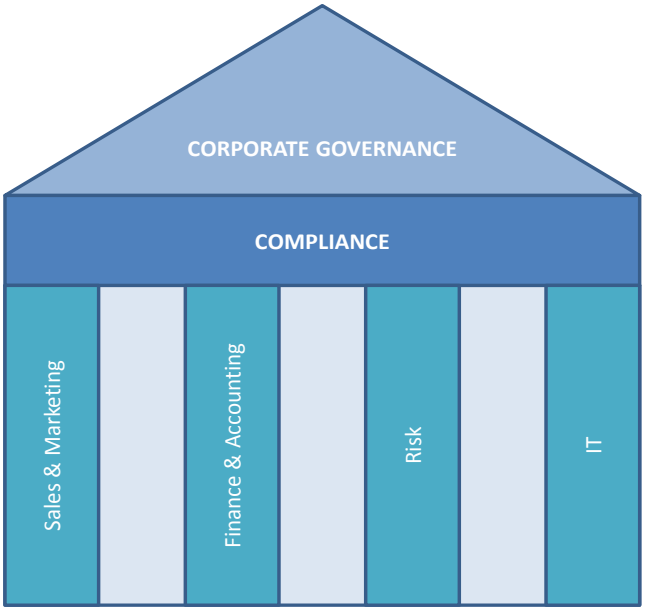


Figure 2: Pillars of compliance [own source]

The key challenges related to the sales and marketing pillar include: 1) provision of all necessary information to customers, presented in an intelligible form; 2) customer fraud and measures to be undertaken against such fraud; 3) international or cross-border requirements, including related to SEPA, FATCA, etc.; 4) pricing limitations, and restrictions related to advertising.

In the area of finance, accounting, auditing and taxation, the key issues are: 1) regulations, standards and other applicable legislation related to capital markets, financial instruments, stock exchanges, auditing and finance; 2) accounting requirements and reporting, monitoring and control.

Risk management is another key pillar where the main challenges include: 1) requirements related to risk governance (e.g. risk strategy, risk appetite policies, risk modelling); 2) capital adequacy and liquidity requirements, including Basel III, ICAAP documentation; 3) other banking risk requirements (e.g. collateral management, treasury; market and credit limits; maximum loan-to-value limits; protection of systemically important chosen institutions).

In the area of IT and data confidentiality, the key challenges are: protection of data, bank secrecy, documentation and data quality and consistency, IT application management.

The resources allocated to compliance should be sufficient and adequately channeled in order to ensure effective compliance risk management within the bank. In particular, the compliance function employees need to possess the qualifications, experience, personal and professional qualities required for performing their duties. This includes correct interpretation of all relevant laws, guidelines and regulations, and estimating the impact which they may have on the activity of company. The professional competences of the compliance function employees, especially with regard to following the latest developments in relevant laws, regulations and standards, need to be maintained by regular and methodical training and education.

Personal responsibility is of special importance. Every bank should appoint a senior officer (Head of Compliance, or Chief Compliance Officer – CCO), charged with the general responsibility of overseeing the identification of compliance issues, overseeing the management of them specific to the organization, and coordinating the efforts of compliance staff.

There are also anumber of key roles of the Compliance Department mentioned in the SIA's White Paper. One of its main responsibilities is the **advisory role** which consists in advising the management and business units on correct implementation of the legislative requirements, policies and procedures, with a view to guaranteeing compliance. Other important obligations of the Department include **education trainings:** the policies, rules and procedures have to be well understood, clarified and implemented into practice. The Compliance Department also exercises a **monitoring** function which consists in current monitoring of operations and business as a whole, with respect to identifying potential problems. Compliance officers need to work in cooperation with officers from other departments having control functions, such as Risk Management and Internal Audit. They should participate in testing the adequacy of the internal supervisory procedures. They should develop risk-based approaches to monitoring and control as effective means for identifying problems. In many cases Compliance Departments, in cooperation with the business lines, may actively **review business operations** to identify potential risks related to regulations, compliance or reputation, and design ways for their mitigation. In many organizations, such departments are also in charge

of the **anti-money laundering** and **fraud monitoring and reporting** programs. Their personnel may participate in the client identification process upon opening new accounts ("know your customer") and in monitoring for potentially suspicious transactions, including unusual patterns in transactions with assets or funds. Compliance Departments are important **points of contact with regulatory authorities**, often in charge of handling and responding to their inquiries and inspections. Another one of their tasks is connected to the outsourcing of services by the organization. Such activities also need to be monitored for compliance risks. [13]

The Compliance Department functions are incorporated in the annual Compliance Plan that sets out the activities planned, including the reviews of sets of rules and internal requirements and their subsequent implementation in the operations of the bank, evaluations and tests of compliance risks, and training staff on relevant topics. This Plan should be risk-based, and its phases monitored by the Head of Compliance Department to ensure proper implementation across business lines and coordination between the various risk management functions.

[10],[11]

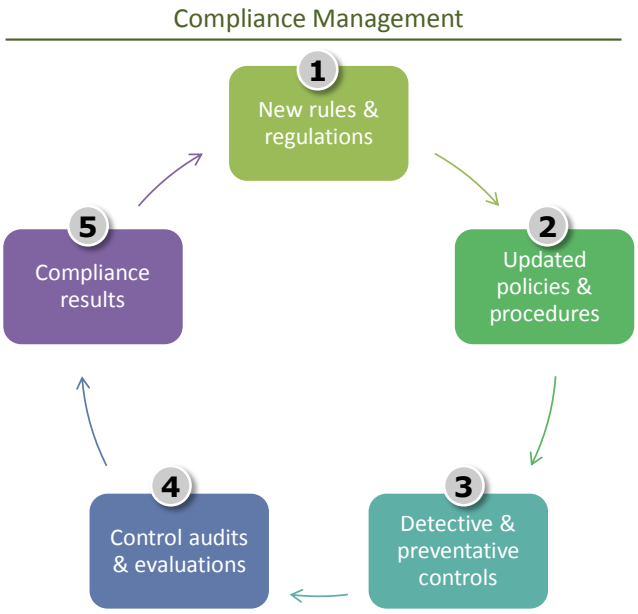


Figure 3: Compliance management [own source]

The company's senior management should serve as advocates of the compliance function, manifesting strong support for its role within the organization and attaching clear priorities to compliance goals. [Deloitte Development LLC (2014), "Tone at the top: The first ingredient in a world-class ethics and compliance program", p.2].

Following the Basel Committee principles, the Board is responsible for approving adequate policies and procedures concerning compliance risk - its identification and management. The Board should also ensure that all internal rules for managing compliance risks are in place and oversee their implementation, including the timely and effective resolution of compliance issues by the management, with the support of the compliance function. The Board may delegate such tasks to one of the board level committees (e.g. the Audit Committee, or the Risk Committee). Underestimating the impact of compliance risk on shareholders, employees,

customers, and the market in general may lead to significant adverse publicity and have detrimental effect on the reputation, even if no laws have been violated.

The senior management, with the support of the Compliance Department, should:

- Constantly monitor and evaluate the compliance risks within the bank (or the group) and adopt action plans for their management. These plans should cover any potential compliance risks (in terms of established company policies, procedures, or their implementation), and measure the need for development of new policies and rules to reduce new risks diagnosed in the process of the periodic compliance risk reviews;
- Periodically submit to the Board, or to the relevant Board committee, a compliance risk report. The information therein should be communicated in a timely and understandable manner, and in such a format as to assist these bodies in making informed decisions as to whether compliance risk in the bank is effectively managed.
- Report in a timely manner to the Board, or to the respective Board committee, all important compliance issues (i.e. issues that can potentially pose material risks of legal or regulatory sanctions, or of significant financial or reputational loss).

The compliance function, as the second line of defense defined by the Basel Committee, should be independent from the other two lines of defense – the business lines and the internal audit. The principle of independence also includes the possibility of some collaboration between the Compliance Department and the business units. In the context of strong interrelations, however, such independence has be guaranteed by clear competences, defining the obligations and responsibilities of each internal body within the organization, and by ensuring seamless information flow between the operational and control functions.

The greater general efficiency and timely identification of the risks to which an organization is exposed, require an integrated system based on the principle of eliminating random elements in the phases of a single process, as well as periodic verification of the areas and persons involved, by means of special protocols. A seamless information flow and standardized procedures allow for efficiency of control and evaluation of the regularity of operations. It is the responsibility of the management to exercise their competences in managing the relations between the various business units so as to ensure achievement of goals and generation of profits while maintaining proper compliance with the legal obligations and ethical standards.

[4],[5]

5. New approaches

The crisis in the first decade of the century has created an altogether different landscape that is likely to stay long after the economy has recovered. Nowadays, an integrated approach to Governance, Risk Management and Compliance (GRC) is applied by many companies.

1) Governance implies the management maintaining organizational transparency and introducing measures for compliance risk mitigation by ensuring that existing policies and standards are observed. Implementing the governance strategy also includes taking corrective steps where policies and procedures have been overlooked, ignored, or violated.
2) Risk Management determines the risk tolerance of the company and has the responsibility to examine and determine the balance between what kind cost of compliance exists and for that purpose the risks associated with noncompliance.
3) A major compliance function is the responsibility for monitoring and assessing the business operations on a daily basis to ensure that this company is compliant with the existing legislation and with the current industry standards and internal rules.

GRC is a closely interrelated system. Compliance by itself is neither functional, nor achievable without governance and risk management. On the other hand, both compliance and risk management are irrelevant without the framework and mechanisms set up by the governance.

Under the current conditions, implementing proper monitoring and compliance is much more challenging for companies which have extensive operations abroad and therefore have to cope with a number of different legislations, local regulations, supervisory norms, cultural and linguistic differences, time zones, etc. Effective compliance nowadays has been calculated to be three to five, and even more times as costly as 10 years ago. At the same time, sanctions and losses resulting from noncompliance, control failures, low and insufficient quality control, lack of transparency in governance, lack of transparency in various processes and systems, are becoming ever more expensive. In addition, boards and senior management staff face increasing risks of fines and personal liability. Shortcomings often lead to extensive media exposures, and to damage for corporate reputations that in some cases have taken decades to build. Failures in compliance and control functions may result in considerable loss of core clients, disruptions in normal business activity, and reductions in share value.

Banks nowadays use a risk-based approach for assessing compliance risk. This bank approach is based on a different set of indicators designed to achieve robust and objective risk models, tailored to the variety of risk situations that may arise in relation to customers, products, or business processes.

Examples of key risk indicators in evaluating client-related compliance risk include:

Country-specific risks include risks related to politically exposed persons, reputational background, incl. regulatory history, business of the customer, products used by the customer, and ownership structure.

The scope of the compliance function covers not only identification, but also measurement and evaluation of compliance risks.

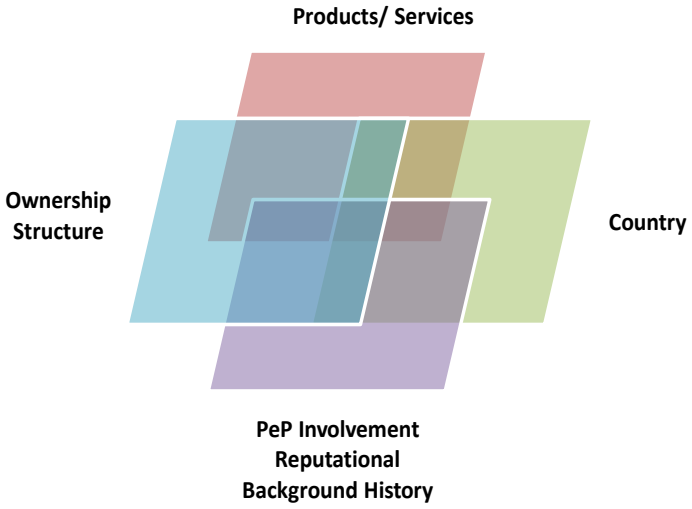


Figure 4: Risk-based client take-on [own source]

The approach of implementing early warning signals and indicators for measuring compliance risk was first established by the Basel Committee guidelines of 2005. It uses quantitative indicators to obtain an enhanced assessment of compliance risk. This new approach opens the doors for technology in the process of monitoring and mitigating risks. It may operate as a useful automated system when performance indicators are developed that filter or aggregate information related to compliance issues (e.g. increase in the number of client complaints, irregularities in the trading activity or in the remittances and other payment transactions, etc.). In this way, the compliance function can more effectively assess the adequacy of the bank's rules and procedures, promptly follow up on any shortcomings and, when necessary, submit proposals for corrective actions.

The Compliance Department should also perform regular and representative compliance tests of the existing policies and procedures. The findings of such tests should be regularly reported to management, according to the bank's procedures and internal levels of competence. The reports need be commensurate with the risk profile of the bank, its size and type of activity.

Many financial institutions nowadays conduct organizational self-assessments in the areas of compliance and control.

This process requires thorough and systematic analysis of the requirements with a view to creating full transparency, and then summarizing them in a coherent and targeted compliance system for further use.

The analysis of requirements should result in developing a questionnaire for assessment of the current levels of compliance. This set of questions is then adapted to the organizational structure (e.g. to determine which units or employees are involved in, or responsible for the compliance, control, or management of particular processes). The line managers are provided with this questionnaire and are required to review the level of compliance in their departments, supplying

evidence of their findings (e.g. written reports, self-audit forms, or descriptions of existing practices).

The completed questionnaires are collected, including the supporting evidence. All documents are compiled for centralized control and validation, which finalizes this assessment phase. The target compliance system and the self-assessment results are used to clarify and identify any shortcomings, and all the necessary steps for overcoming them.

For assessing compliance risks, banks design approaches which integrate monitoring and evaluation of such risks both in terms of products and processes, and across the organizational business lines. New and efficient methods are implemented to meet the compliance requirements, including development of an internal framework to map the rules, regulations, standards, etc. of the organization. Such a framework should be capable to monitor and assess the impact of ongoing compliance changes on the business, and determine the key efforts to be directed at implementing the global, or respectively the local standards and rules.

In the financial sector, the new laws and regulations involve much more stringent compliance and reporting, which is why here the compliance management software plays a particularly important role. Such software must not only be adapted to, and reflect the requirements and provisions of current laws and regulations, but also be able to track, record, and verify the financial data against actual assets and transactions, and produce detailed reports at any given moment to ensure that the company remains compliant at all times.

[9],[10],[13]

6. Compliance management framework

The regulations with which the activities of a company need to comply are numerous and varying in their scope, from finance and accounting to physical security. These regulations are transformed into internal procedures, policies and rules.

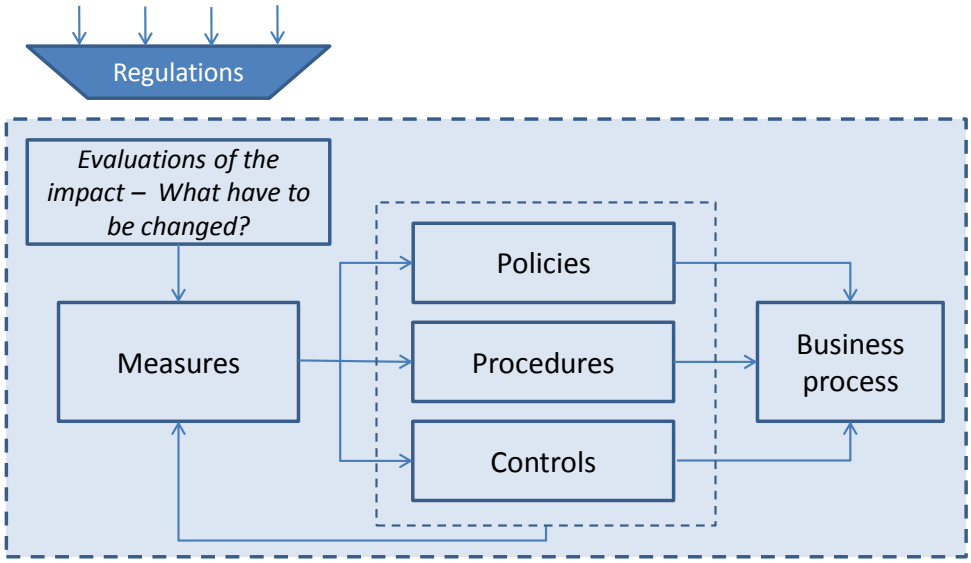


Figure 5: Basic process of regulatory compliance [own source]

Regulations are documented and communicated in ordinary language which sometimes renders discovering of shortcomings or contradictions a difficult task. At times, they seem so

deliberately abstract or obscure that even ensuring that every party involved in compliance management has the same understanding may be challenging. In addition, organizations do not necessarily receive continuous and up-to-date information on their compliance status, especially when changes to regulations occur. That is why they need to be constantly aware of the new versions of legislation and implement sophisticated compliance measures which are usually associated with high costs. Moreover, today's compliance management practices require that audits are conducted on a regular basis so that the company may be certified as compliant with regulations, which necessitates additional expenses.

Compliance management continues to be a process heavily reliant on manual procedures, performed by auditors on the basis of samples which are not always error-proof, i.e. the automation level in governance, risk, and compliance management still remains relatively low.

Compliance requirements being usually very complex, auditors must possess the necessary experience and qualifications to conduct a regulatory compliance check of a given system or an entire organization. Companies seeking to ensure regulatory compliance of their business processes often need to administer separate projects for different types of regulations.

When a company deals with several legislative of regulatory texts simultaneously, this poses a serious challenge to managing the compliance enforcement on business processes. Auditors cannot possibly check the entire business landscape and only deal with selected samples. Thus, if it desires to launch preliminary internal audits, the organization needs an internal compliance team which is a source of additional costs. The resources required for conducting of internal audits may be minimized and the chances of success before the actual audit respectively increased by an integrated framework for compliance management. Automated checking of the entire range of business processes may also increase the coverage and accuracy of regulatory compliance.

Usually, in their original form, regulations are very abstract stipulations. This is due mainly to two reasons:

- Keeping the texts abstract means providing greater independence from implementation point of view, and increases the flexibility of their adaptation to various business issues;
- The writers, respectively users of regulations, are usually lawyers and business people. They often use professional terms, complicated text structures and industry definitions which are unintelligible for the non-specialists.

That is why the actual meaning of a regulation may be interpreted or implemented differently by the different units within one organization, or across the landscape of the organizations involved. This can decelerate the compliance management process, rendering it incoherent and less efficient. To avoid that, achieving of semantic uniformity of the data and definitions contained in the regulations is strongly desirable.

A successful framework needs to meet the following requirements:

- **Change management**: Changes in regulations should be accompanied by dissemination and promulgation across the entire landscape of the affected organizations. The capacity of a compliance management framework to achieve that will give it an advantage to other approaches and, respectively, minimize compliance management expenses.

- **Accountability and Traceability:** Compliance management rules should be able to draw conclusions on the condition of business processes and question these processes; make decisions based on the information obtained, and initiate actions relating to the business processes. The decision-line and the bodies responsible have to be clearly defined. A sophisticated compliance management framework has to contain functionalities for documenting and subsequent access to actions taken, resources used, reasons for acting, and persons responsible for decision-making.
- **Complexity**: The compliance management framework should be adapted to representing various regulatory models and not be tailored to a single specific activity or field. It needs to support various degrees of sophistication and cover a wide scope of implementation requirements originating from different legislations.
- **Efficiency**: This requirement in the context of compliance policies refers to the question whether such policies define the business processes in the desired degree of validity and accuracy. The compliance framework must offer features and enforcement tools that evaluate and enhance efficiency. Failing that, it is very difficult to show and determine if the company gets the most out of its policies, and also if they actually contribute to the achievement of business goals while helping observe regulatory provisions.
- **Cost:** In the design and introduction of a compliance management framework, the essential requirement of reduction of overall costs with regard to time and resources needs to be considered.
- **Enforceability:** Any framework dealing with defining policies needs to also provide instruments for their enforcement, in the sense that business processes need to be strictly in line with them. The management has the responsibility for compliance policy enforcement and it has to resolve some challenges, namely: (i) to formalize the decision-making process, (ii) to channel compliance knowledge to all affected staff, and (iii) to provide the framework with tools for interpreting that knowledge. Going beyond the pure checking of compliance, such an enforcement process will ideally lead to a highly collaborative situation, involving active interaction between the different partners in the business process.
- **Scalability**: Regulations are by definition complex, and their dynamic nature suggests an even further increase of complexity with their evolution. The efficiency of a compliance framework should not depend on the volume of regulatory provisions to be implemented, neither on the scale of business operations affected by them.
- **Impact Analysis**: Depending on their design and structure, some policies may relate to others, or even be derived from them. Therefore, making changes to separate policies or to the compliance framework in general inevitably has its effect on the manner other policies operate and on the entire business process. In this respect, the efficiency of compliance management depends on having mechanisms in place for preliminary and, respectively, subsequent analysis of the change impact.

Some of the key challenges still ahead of compliance management are to ensure universal interpretation of regulations, and further automate the processes of compliance enforcement.

[7],[8]

CHAPTER 3: DEONTIC LOGIC

1. History

The word deontic means ‘as it should be’ or ‘that which is binding or proper’ and is derived from the Greek word ‘δεόυτως’. Deontic Logic is the study of expressions only taking into consideration logical words and the occurrence of normative expressions meaning ‘obligation’, ‘duty’, ‘permission’, ‘right’. Such expressions are termed deontic expressions and build up the deontic sentences.

In 1926, Mr. Ernst Mally, an Austrian philosopher proposed to construct a new logic with sentential letters, quantifiers and operators. This logic is named ‘Deontic’.

Von Wright was the first to propose a formal definition of the deontic logic (1951).

Deontic logic is part of the symbolic logic, strongly influenced by the modal logic and using the following notions. Some of them are used more often than others.

[14],[17]

Permissible	must
Impermissible **(forbidden, prohibited)**	“supererogatory”
Obligatory	indifferent / significant
Omissible (non-obligatory)	“at least one can do”
Optional	“better than / best / good/bad”
Ought	“claim / liberty / power / immunity”

Table 1: Table of notions [14]

This logic is often used in law, business organizations, security systems, and social organizations.

2. Representation and Syntax

2.1. Formal Language

Deontic Logic syntax is based on predicate and propositional logic. Logical operators used in proposition composition are '∧', '∨', and '→', '↔'.

Predicate composition consists of attributes – binary predicates, predicates – true or false parameters and quantifiers '∀', '∃'.

The Non-Deontic part consists of the so called 'sentential letters' like *A, B, C, P, Q,* the individual variables *x, y, z* and the individual constants *a, b, c*, the so called 'propositional quantifiers' ∃ (existential quantifier) and ∀ (universal quantifier), the so called 'sentential constants' **V** (*Verum,* Truth) and **Λ** (*Falsum*, Falsity).

The propositional variables *p, q, r* express the meaning of a sentence.

There are different connectives:

- Modalic propositional connective: ~ (negation) and
- Dyadic propositional connectives as **Λ** (conjunction); **V** (disjunction); → (conditional); ↔ (biconditional).
- Auxiliary signs: () (brackets).

The basic statement is that each proposition could be either true T or false F, but there is no possibility to be both of them.

Representation in a so called truth table can be expressed in the following table [Table 2]:

p	***q***	***~p***	***p ∧ q***	***p ∨ q***	***p → q***	***p ↔ q***
T	**T**	F	T	T	T	T
F	**T**	T	F	T	T	F
T	**F**	F	F	T	F	F
F	**F**	T	F	F	T	T

Table 2: Truth table [17]

The negation (~) is true only if the appropriate formula is also false, otherwise it could not be true and it is false. The conjunction (∧) of different formulas will be true only in case all of them are true, otherwise it is false. The disjunction (∨) of different formulas will be true if only at least one of them is true, otherwise it is false. The so called "material conditional" (→) is only true if its antecedent is false, or its consequent is true, otherwise it is false. The bi-conditional (↔) is true if the other component of the formula is also true or it is false if the other one is also false.

- Conjunction '∧': 'A ∧ B', implies that 'A' is true **and** 'B' is also true.
- Disjunction '∨': 'A ∨ B', implies that 'A' is true **or** (maybe) 'B' is also true.
- Negation '~': '~A', implies that 'A' is **not** true in any case.
- Implication '→': 'A → B' implies that 'A' determines 'B' (**if** 'A' is true it means that **then** 'B' is **also** true)"
- Bi-conditional '↔': 'A ↔ B' implies that for every (without exception) true 'A', 'B' is also true.

Another possibility to express the meaning of a function is by using *quantifiers*. The universal quantifier '∀' represents the meaning of 'all' and the existential quantifier '∃' represents the meaning of 'some'.

$\forall xPx$ - should be read as 'For all x's, Px'

$\exists xPx$ – should be read as 'For some x's, Px'

If '=' is used as a biconditional, the following statement is used:

$\forall xPx = \sim\exists x{\sim}Px$

The deontic part of this vocabulary includes the imperative operator '**!**' (let it be the case that) connective, **f** and ∞, the also sentential constants as ∪ and ∩.

- !A means "A ought to be the case"
- A f B means "A requires B"
- A ∞ B means "A and B required each other"
- U means "the unconditionally obligatory"
- ∩ means "the unconditionally forbidden"

[14],[17],[21]

2.2. Mally's Axioms

((A f B) & (B→C)) → (A f C)

If A requires B, and also if B then C, means that A requires others who are expressed in terms C.

((A f B) & (A f C)) → (A f (B &C))

If A requires B, also if A requires C then A requires B and C together.

(A f B) ↔ !(A→B)

A requires B only in the case an obligation exists that if A then B.

The so called “unconditionally obligatory” is always obligatory.

ꓱU !U

The negation of an unconditionally obligatory is not required.

~(U f ∩)

[15],[32]

3. Deontic Logic Construction

3.1. Traditional Threefold Classification (TTC) and Modal Square (MS)

The traditional threefold classification consists mainly of three classes – *obligation, optionality and prohibition*. All propositions are divided into them, but one proposition can exist in only one of them. The propositions which are permissible can be either obligatory or optional. The propositions which are omissible can be either optional or impermissible. One of the classes contains possible propositions, the other contains impossible propositions, and the third – only some of the possible ones.

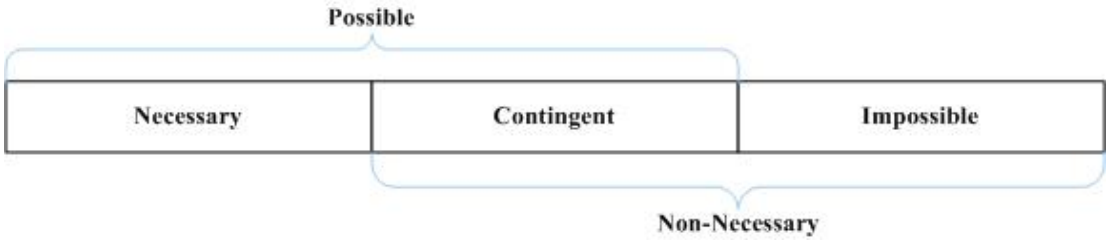


Figure 6: Traditional Threefold Classification [14, page 8]

The truth of *p* in the modal logic may be necessary, and also possible or impossible.

The Modal Square is another interpretation of this kind of logic.

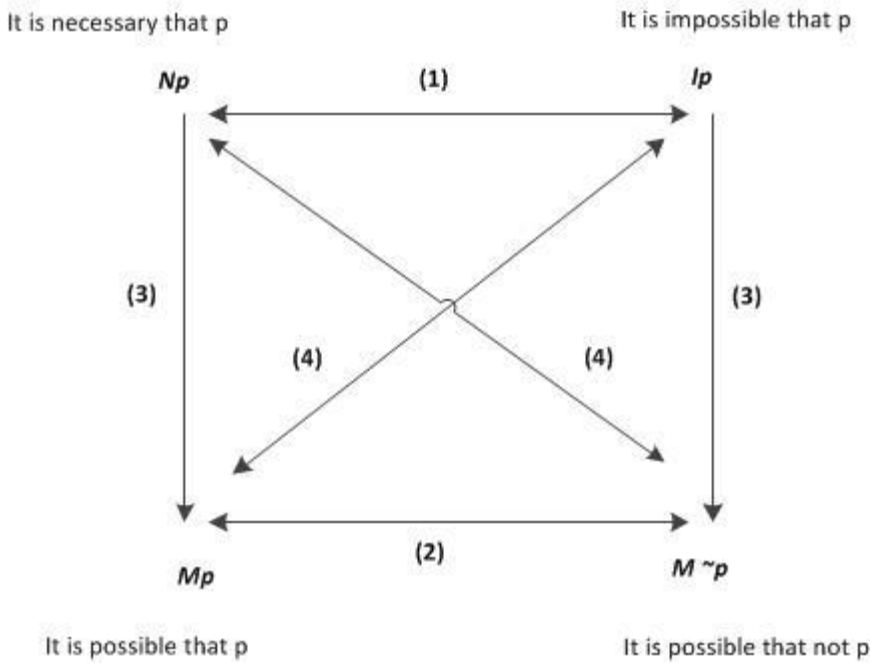


Figure 7: Modal Square [14, page 8]

The pairs *Np* and *M~p* are contradictory to each other. So is the case with the pairs *Ip* and *Mp*. *Np* implies *Mp* and *Ip* implies *M~p* – subalternation. Either *Np* or *Ip* can be true – contrariety and either *Mp* or *M~p* can be false – subcontrariety.

In deontic logic there are permission, obligation, prohibition and omission possibilities.

[14],[16]

3.2. The Traditional Scheme (TDS)

The following normative statuses belong to the "Traditional Scheme":

- "**OB** – it is obligatory that"
- "**PE** – it is permissible that"
- "**IM** – it is impermissible that"
- "**OM** – it is omissible that"
- "**OP** – it is optional that."

Normally the first or the second are used as basis, while the others are later specified.

- PE*p* ↔ ~OB~*p*

Something is allowed, or "permissible" if and only if its own negation is also not obligatory.

- IM*p* ↔ OB~*p*

Something not allowed, or “impermissible” only in the case if its negation is also obligatory.

- OM*p* ↔ ~OB*p*

Something is “omissible” only when it is nothing else then “obligatory”.

- OP*p* ↔(~OB*p* & ~OB~*p*)

Something is “optional” only if it is neither “obligatory”, nor its negation is “obligatory”.

This is called the “Traditional Definitional Scheme”. A syntactic variant is when OB is replaced with □, PE with ◊.

[15],[32]

3.3. Deontic Square (DS)

Obligation

For any individual *x* at a time *t* regarding an action *p* there are the opportunities that either *x* performs *p* at *t*, or *x* does not perform *p* at *t*. This is the obligation to perform *p* and not ~*p* *(Obligatory).*

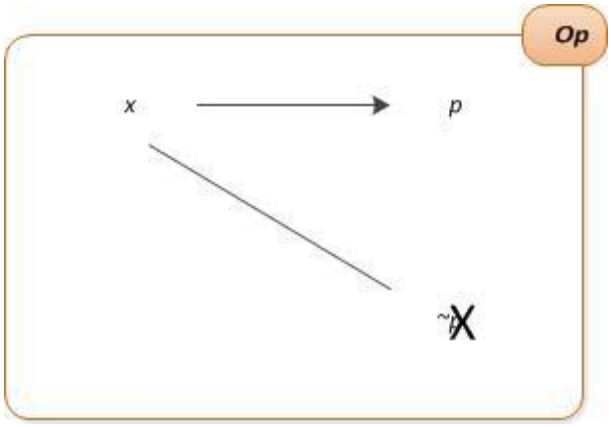


Figure 8: Obligation

Prohibition

For any direction of *x* to perform ~*p* and discouraging *x* to perform *p* there is a prohibition. This is the so called prohibition to perform *p (Impermissible).*

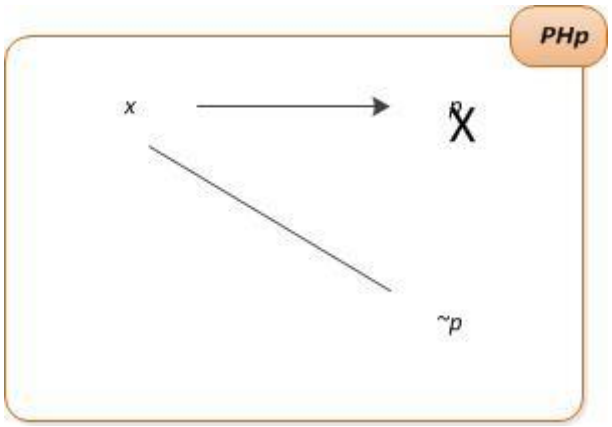


Figure 9: Prohibition

Faculty

Faculty means to give the opportunity to choose, where either the path – p or the path ~p can be taken.

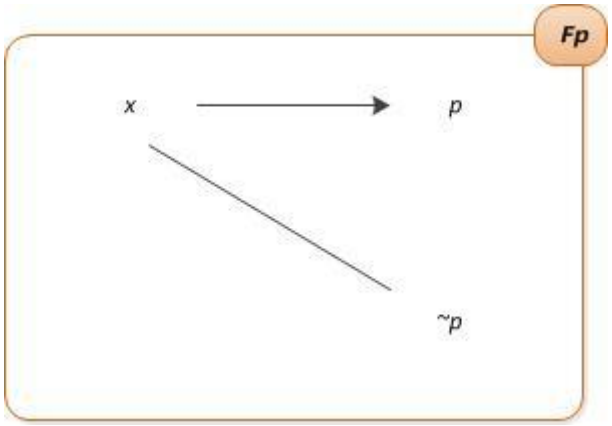


Figure 10: Faculty

To use the expression "permission" to perform *p* is the same as to give permission to perform *~p*. To prohibit *~p* is another situation. In the first case *p* is facultative and in the second *p* is obligatory.

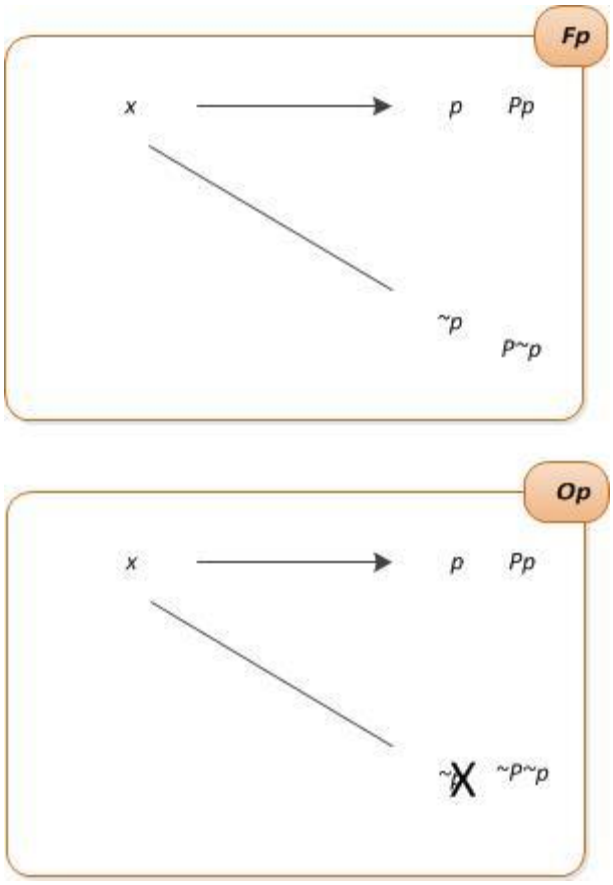


Figure 11: Obligation and Faculty

In order to restrict double permission and to have only simple permission, *p* is obligatory is the same as ~*p* is impermissible. The Obligation of *p* contradicts the permission of ~*p* as well as the prohibition of *p* and its permission. In other words, the Obligation contradicts the Omission. Prohibition and Permission contradict each other as well. The Obligation logically implies the Permission, as well as the Prohibition implies the Omission. Obligation and Prohibition could not be true at the same time, as well as Permission and Omission could not be false at the same time.

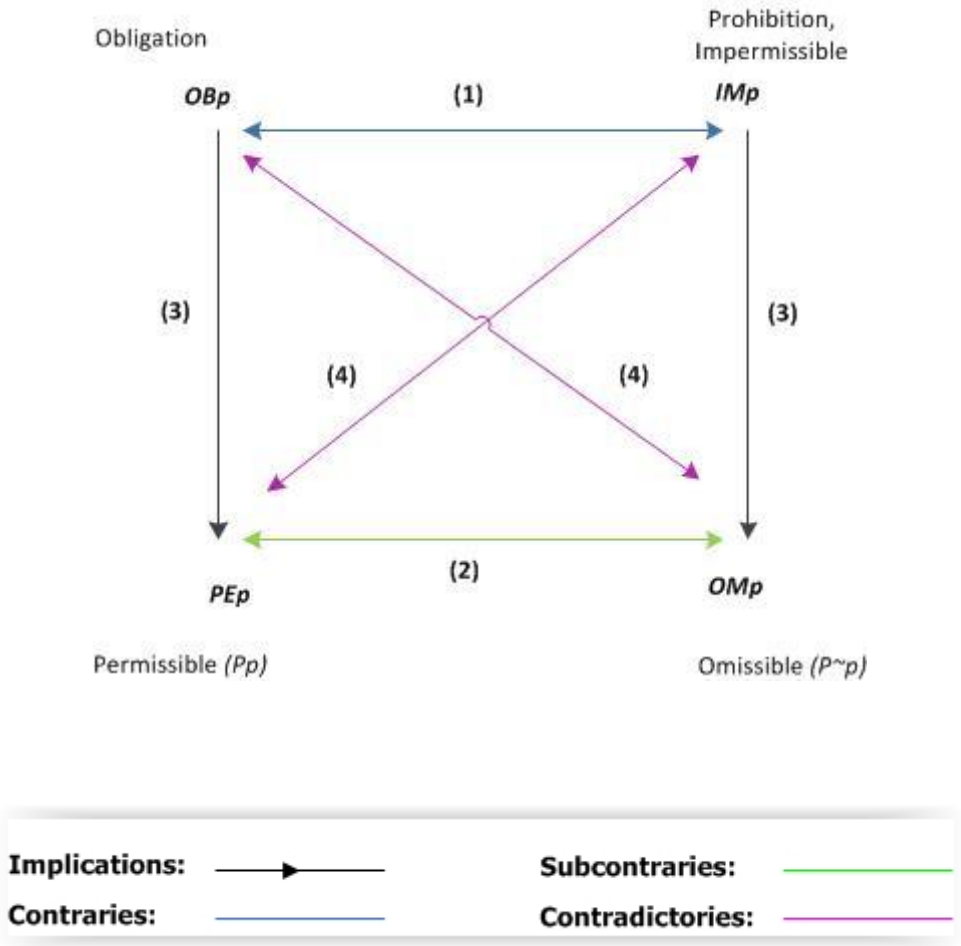


Figure 12: Deontic Square [14, page 8]

If it is necessary then it is true, and if it is true it is also possible. If it is impossible then it is not true and it is also not necessary.

[16]

The two principles of alethic modality are as follows:

"If □*p* then *p* (if p is required, then p is true)";

"If *p* then ◊*p* (if *p* is accepted as true, then it is also possible)".

The deontic analogs of these rules are expressed as:

"If OB*p* then *p* (if an obligation exists for *p*, then *p* is true)";

"If *p* then PE*p* (if *p* is true, then permission exists for *p*)".

If IM*p* then ~*p* (if *p* is impermissible, then *p* could not be true).

If ~*p* then OM*p* (if *p* is not true, then *p* is also omissible).

The Deontic Square (Fig.12) of Opposition and the Threefold Classification can also be expressed formally:

DS: $(OBp \leftrightarrow \sim OMp) \& (IMp \leftrightarrow \sim PEp) \& \sim (OBp \& IMp) \& \sim (\sim PEp \& \sim OMp) \& (OBp \rightarrow PEp) \& (IMp \rightarrow OMp)$.

TTC: $(OBp \vee OPp \vee IMp) \& [\sim (OBp \& IMp) \& \sim (OBp \& OPp) \& \sim (OPp \& IMp)]$

DS is tautologically tantamount to the other principle that the other obligations do not have any conflicts with each other. The same is equivalent for TTC.

NC: $\sim (OBp \& OB\sim p)$.

[15],[31]

If optionality is added, the following deontic hexagon is created as well:

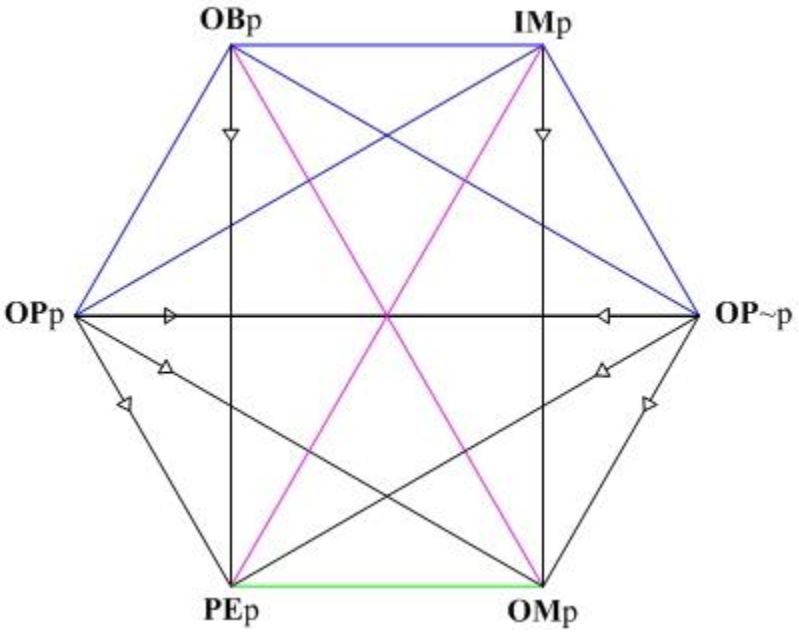


Figure 13: Deontic hexagon [14, page 8]

4. The Standard system of (DL) Deontic Logic

The Standard Deontic Logic (SDL) is one of the most popular and studied variations of the so called 'modal logic'. It is represented as 'modal deontic logic' based on one-place operators as *like~, unlike* →.

There are three modal operators 'O' for 'obligatory', 'P' for 'permitted' and 'F' for 'forbidden'. (Wright introduced them in 1951). OA is also used, in the sense 'it is obligatory that A', and PA in the sense 'it is permitted that A' and FA in the sense 'it is forbidden that A'. These notions were later called deontic modalities. An obligation norm can be formulated that leads to prohibition or permission and vice versa. For example 'Following the rules is obligatory' is equivalent to 'Not following the rules is prohibited' or to 'Not following the rules is not permitted'.

[17],[31]

4.1. SDL axioms and rules

- All tautologous formulas are coming from the language 'TAUT'.

  TAUT is also a standard for all usual modal systems.

- OB(p→q)→(OBp→Obq) (*OB-K)*

  This K axiom used in all usual modal logics means that if some material conditional is also obligatory, then there is an obligation for its antecedent if it is consequent.

- Obp→~OB~p (*OB-D)*

  This expression means that *p* will be fixed as obligatory if its own negation is not.

- "If ⊦p and ⊦p → q then ⊦ q (*MP)*" *Modus Ponens*

  If the conditional and the antecedent are both theorems, the consequent is also so.

- If ⊦ p then ⊦ Obp *OB-NEC*

  If something is taken as theorem, the statement for its obligation must also be a theorem.

[32]

Important theorems:

OB⊤	(OB-N)
~**OB** ⊥	(OB-OD)
OB(p & q) → (Obp & Obq)	(OB-M)
(Obp & Obq) → OB(p & q)	(OB-C / Aggregation)
Obp v Obp v Imp	(OB-Exhaustion)
Obp → ~OB~p	(OB-NC or OB-d)

OB-OD: With '⊥', a logical contradiction is marked. OD expresses the logical truth that the rule is not obligatory.

Important rules:

If ⊢p → q then ⊢ **Ob**p → **Ob**q (**OB**-RM)

Proof: It is supposed that ⊢p → q. If OB-NEC is considered, then ⊢ **Ob**p (p → q), and then if OB-K is considered then, ⊢ **Ob**p → **Ob**q.

If ⊢p ↔ q then ⊢ **Ob**p ↔ **Ob**q (**OB**-RE)

[14],[16]

4.2. SDL Semantics

A set of potential accepted worlds ***W*** exists and ***A*** is a relation with the purpose that ***Aij*** if and only if ***j*** represents world where everything is obligatory in ***I*** holds. No violations arise in ***j*** of the obligations that are holding in ***I***. All worlds related to ***A*** are expressed as $\boldsymbol{A^i}$. For every ***I,*** at least one of ***i***-acceptable worlds exists. All propositions are either false or true. If proposition ***p*** is true the world will be indicated as a ***p***-world. The truth-functional operators are the same for each world. For every world ***I*** there are ***i***-acceptable worlds, and all are corralled together in the following logical space:

A^i

The truth-conditions, relative to ***I*** for the deontic operators are expressed as:

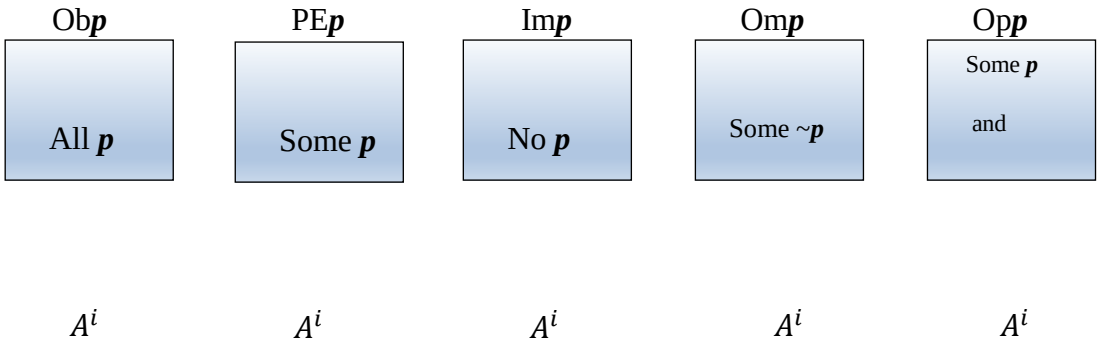


Figure 14: Truth-conditions [14, page 26]

p is obligatory if it is included in all the i-acceptable worlds, it is permissible if it is included in some such worlds, impermissible if it is included in no such world and it is omissible if its negation is included in some such world, and optional if *p* is included in some such worlds, and so does ~p.

[14],[30]

4.3. Norms

There is no specific representation for deontic norms. *Table 3* gives the most common norms and their meanings. The notions of permission, obligation and prohibition allow us to classify different regulations and requirements in formal concepts. Deontic logic is very convenient to express, or represent legal systems. Its language consists of normative notions which are suitable for representation and specification of rules. The different notions are also essential in their representation and allow for classification. The principles of Deontic logic give us the opportunity to represent compliance regulations, processes, policies, with respect to their specific targets. Deontic logic is also applied in the automation of the process workflows, use

of computers, electronic data exchange, depending on the specific application. It is a convenient way to represent legal systems and their processes. DL provides a new language with normative notions which are suitable for representation of rules and regulations.

[18],[30]

Law	Meaning
Relation of permission to obligation	
PA ≡ ~O~A	Permission of 'A' is specified and showed as the negation of obligation of negated 'A'.
OA → PA	If 'A' is obligated, then 'A' is also permitted.
~PA ≡ FA	'A' is not permitted means also that 'A' is forbidden.
F~A ≡ OA	An equivalent exists between prohibition of negation of 'A' and the obligation of it.
Dissolution of deontic operators	
(O(A ∧ B)) ↔ (OA ∧ OB)	If there is an obligation for the conjunction of 'A' and 'B', then it means that the conjunction of the obligated 'A' and obligation 'B' is true and the opposite as well (vice versa).
(P(A ∧ B)) ↔ (PA ∧ PB)	If there is a permission for the conjunction of 'A' and 'B', then it is also true the conjunction of permitted of 'A' and permitted 'B'. The same visa vesta.
Compound Commitment: commitment of one thing is followed of the commitment of another	
(OA ∧ O(A→B)) → OB	If there is an obligation of 'A', and this one gives the obligation of 'B', then there is also an obligation of 'B'.
(PA ∧ O (A→B)) → PB	If there is permission of 'A', and this one gives the obligation of 'B', then there is a permission of 'B'.
(~PB ^ O (A → B)) → ~PA	If there is a prohibition for 'B', and 'A' also commits its obligation, then there is a prohibition for 'A'.
(O(A → B∨C) ∧ ~PB ∧ ~PC) → ~PA	If there is an obligation of 'A' and this one commits to the choice between two different forbidden 'things' as 'B' and 'C', then there is also prohibition for 'A'.

~((O(A∨B)) ∧ ~PA ∧ ~PB	It is logically impossible that 'A' and 'B' are obligated and forbidden at the same time.
OA∧((O((A ∧ B)→C)) → (O(B→C)	If 'A' and 'B' commit to 'C', and 'A' and 'B' are obligated, then 'B' alone obligates 'C'
O(~A→A) → OA	If failure of 'A' obligates 'A', then 'A' obligated

Table 3: Deontic Norms (Wright 1951), [19, page 15]

5. Standard Deontic Logic Problems

5.1. The Chisholm paradox

The following statements are determined:

1. "It ought to be the case that" a man named Jones goes to help his friend.
2. "It ought to be the case that" if he goes, he tells him he is on the way (he is coming).
3. If he does not go, then he ought not to tell him that he is on the way (that he is coming).
4. He does not go.

These statements are totally independent of each other and consistent, and their translation in SDL logic should also have these properties.

The following statements express the Chisholm set written in semiformal language.

P means HELP

q means TELL

(1) Obligatory *p*

(2) *p* → Obligatory *q*.

(3) ~*p* → Obligatory ~*q*.

(4) ~*q*.

The following statements exist as well:

(5) p.

(6) Obligatory q.

(7) Obligatory $\sim q$.

Statements 1-4 are logically independent of each other and consistent. Statements (3) and (4) imply (7). Statements (2) and (5) imply (6).

One of the possible translations of Chisholm statements (1) to (4) is done by Jones and Pörn as follows:

(1a) Op

(2a) $O(p \rightarrow q)$

(3a) $\sim p \rightarrow O \sim q$

(4a) $\sim p$

There is independence but no consistency.

Another translation done by Jones and Pörn is the following:

(2b) $p \rightarrow Oq$

There is no independence but consistency, as (4a) implies logically (2b).

(3b) $O\ (\sim p \rightarrow \sim q)$

By replacement of (3a) with (3b) there is again consistency but no independence, because (1a) implies (3b).

On the other hand if (2) and (5) imply (6), and (3) and (4) imply (7), (3b) and (2a) are not possible.

The translations in SDL are either dependent or inconsistent, therefore such a translation is a 'paradox'.

[18],[32]

5.2. "The Paradox of the Gentle Murderer" (Forrester 1984)

The following statements are determined:

1. “It is obligatory that John Doe does not kill his mother”.
2. “If Doe does kill his mother, then it is obligatory that Doe kills her gently”.
3. “Doe does kill his mother (say for an inheritance)”.

[14]

If we assume that

k means KILL

$\sim$ means not KILL

g means gently

the statements described above can also be determined as follows:

(1) $\mathrm{OB}{\sim}k$

(2) $k \rightarrow \mathrm{OB}g$

(3) k

From (2) and (3) follows that **OB***g* by MP. If the following proposition is added:

“Doe kills his mother gently only if Doe kills his mother”.

(4) $g \rightarrow k$

Using OB-RM it follows that **Ob***g* → **Ob***k* and using **MP** then comes back **Ob***k*. This means that if John Doe kills his mother, then he has to kill her gently and he will do so and he is actually obligated to unconditionally murder his mother.

[14, page 38],[18]

6. Deontic Model

The deontic model (*Figure 15*) consists of different relations, attributes, axioms and concepts. Concepts are descriptions of processes in the construction domain. The relations represent interactions between the concepts.

Important questions are:

- What does the process check?
- What norms are applicable?
- What do they describe?

Compliance Checking Process: represents a set of actions that check one subject by all applicable norms.

Compliance Agent: represents a person or organization involved in the project, marked as 'subject' of the compliance.

Compliance Assessor: the 'compliance agent' is evaluated for compliance by the 'compliance assessor' (owner, consultant, manager, government authority).

Compliance Checking Scope: is the range of the checking process in two scope dimensions: the project phase (business planning, execution) and the compliance topic (quality, environment, costs).

Compliance Checking Mechanism: behavioural method used to perform the behaviour checking process.

Subject: represents an entity (process, role or document) that is subject to the behaviour checking.

Attribute: represents an entity (start/end time, resource, cost, deontic document, size, duration).

Checking Attribute: represents a specific characteristic if the behaviour is assessed.

Norm: is part of some law, rules, principles, regulations. A norm consists of one or even more deontic rules.

Deontic Document: represents documentation of one or even more norms. In a deontic document, deontic rules are stated.

Deontic Rule: a rule that identifies one or more deontic identifiers as "*obligation* (must), *permission* (allowance), and/or *prohibition*)".

Deontic Prescription: represents a rule for deontic *obligation, prohibition* or deontic *permission*. One or more deontic-rules correspond to one or even more deontic-prescriptions.

Authority: represents an organization or person that has the power to regulate a norm and the compliance to a specific norm. Such person or organization also has the power to issue a permission, a deontic document, or to grant an exception.

Deontic Exception: represents renouncement of *deontic duty* allowed by an *authority*.

Compliance Checking Result: represents the adjudgement of the "*compliance checking and monitoring process"*. It shows if the *subject* and also the *compliance agent* are at the same time compliant.

Compliance Checking Consequence: describes the effects of the checking result and also represent the compliance of the so called *compliance agent*.

[17],[19]

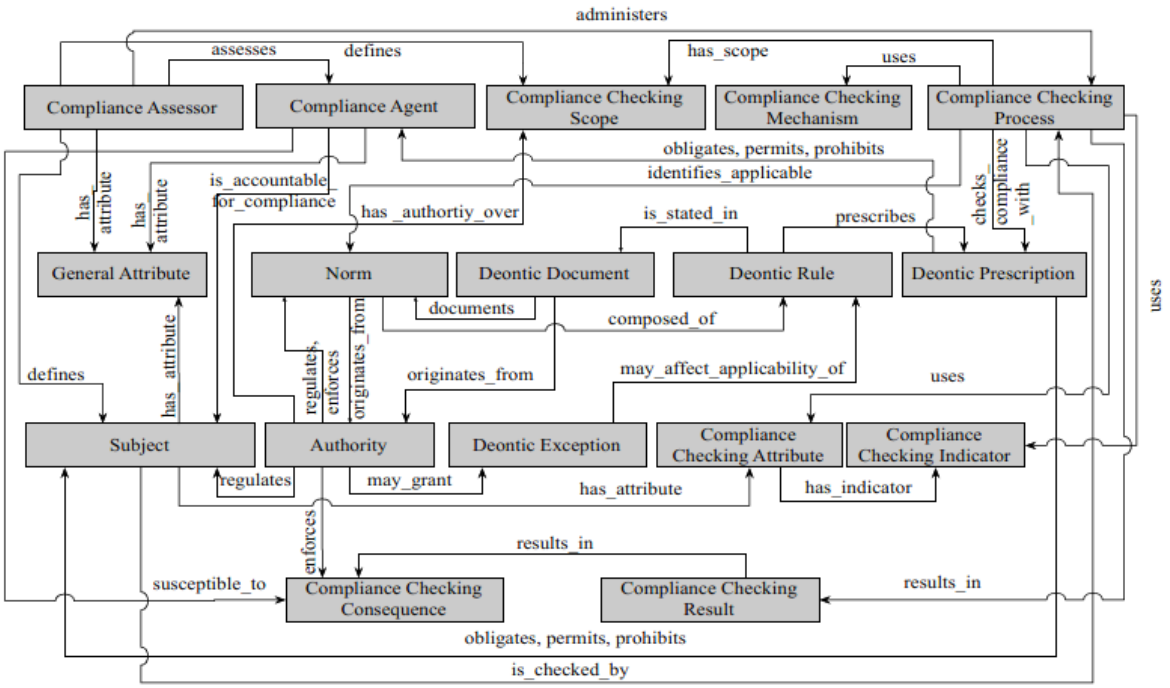


Figure 15: Main Deontic Model [19, page 28]

6.1. Hierarchy and Relations

The concepts described in *Figure 15* consist of sub-concepts, building a concept of hierarchy (*Figure 16*). The hierarchical relations are ‘is-a’ and ‘part-of’ relations.

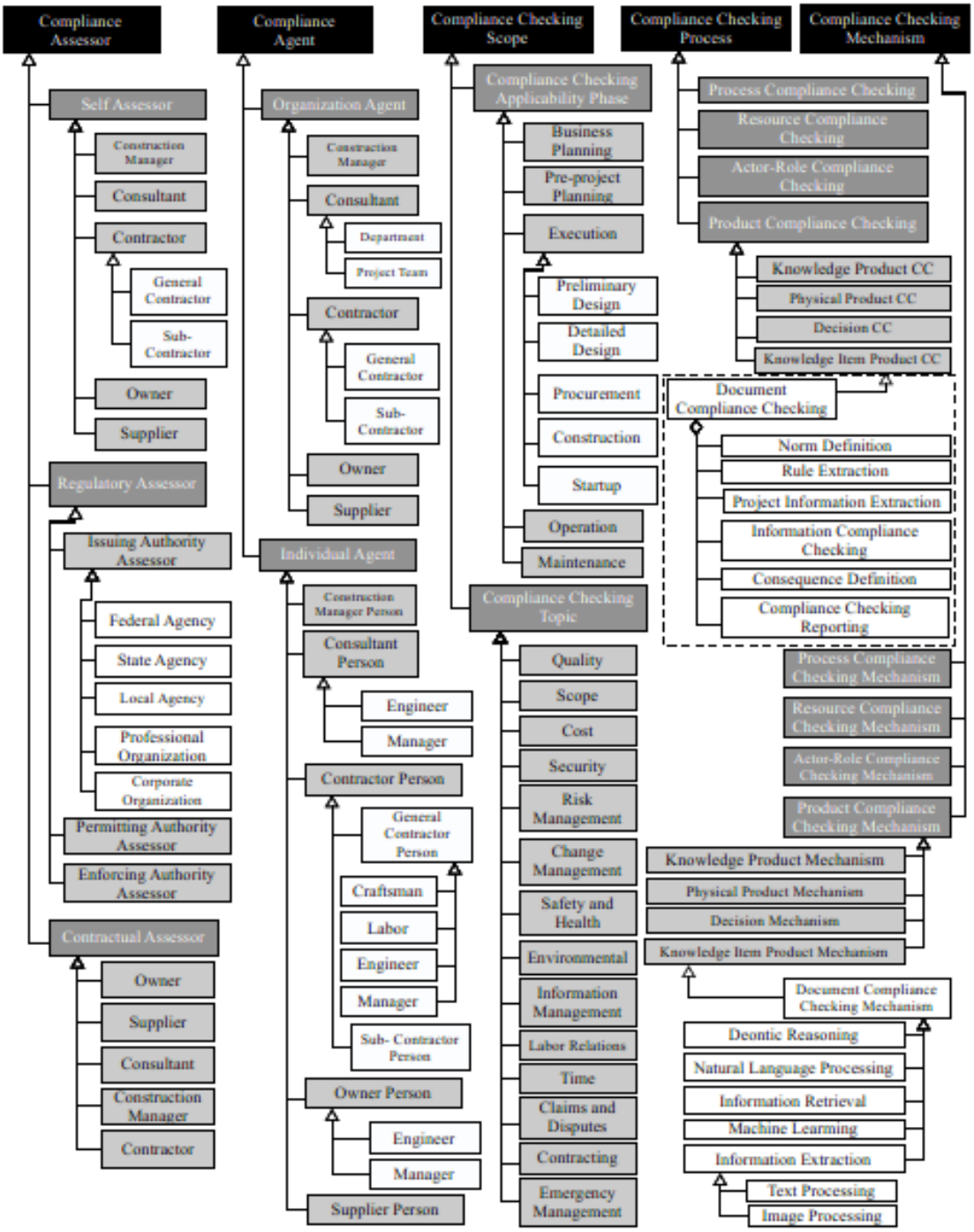


Figure 16: Deontic Model Compliance Hierarchy [19, page 31]

Compliance Assessor

There are different types of *Compliance Assessors*.

- Self-Assessor – these are the project stakeholders who are responsible for checking compliance within the organization. Examples for *Self-Assessors* are the owners, contractors, construction managers.
- Regulatory Assessor – these are the *issuing authority*, *enforcing authority* or *permitting authority* such as federal agency, professional organization, local agency, corporate organization.
- Contractual Assessor – represents the contractually-bounded stakeholders who are checking from the contractual counterpart side.

Compliance Agent

There are two major types of *Compliance Agents*.

- Organization Agent – represents one organization as a whole. That could be a consultant, contractor, an owner.
- Individual Agent – could be a manager, engineer, craftsman.

Compliance Checking Processes and Mechanisms

Every subject is tested under the *compliance checking process* and every process consists of sub-processes (*Figure 16*). The type of the subject is important and defines the type of the "compliance checking and working mechanism". If different types of subjects (documents) exist, they will be checked under different compliance checking processes. For example, the "document compliance checking process" (*Figure 17*) consists of six sub-process.

[19],[23],[28]

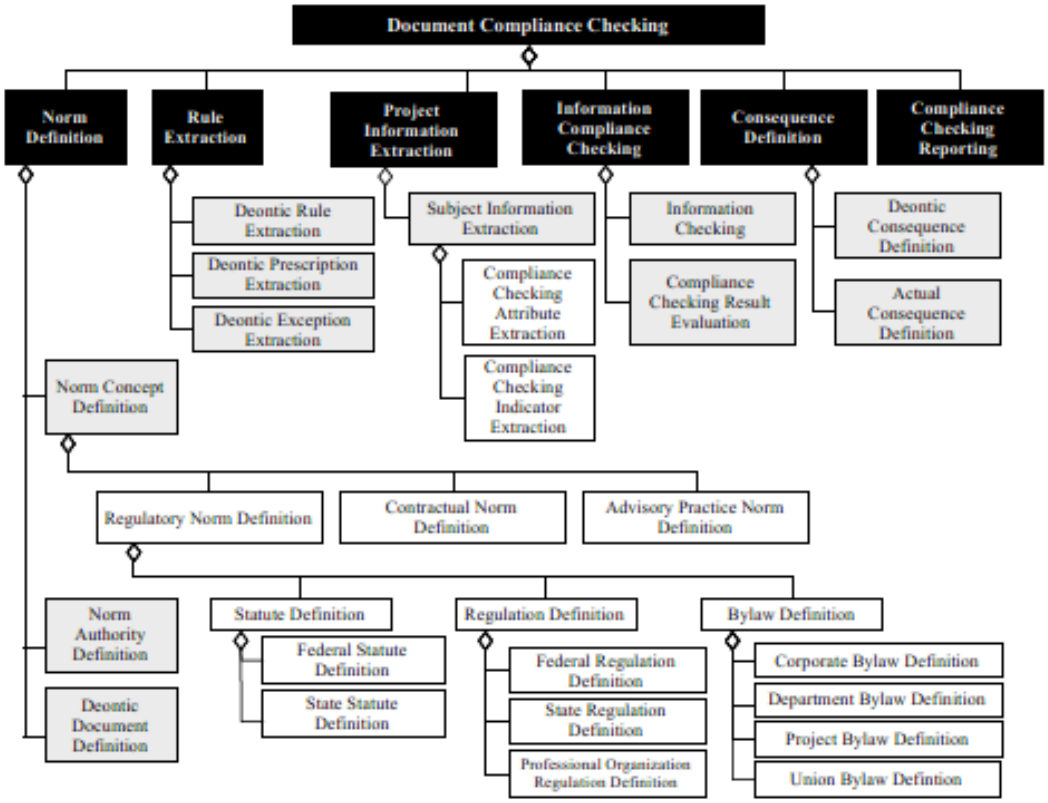


Figure 17: "Document compliance checking process" [19, page 32]

1) Norm Definition

   The *Norm Definition* sub-process consists of:

   - Norm Concept Definition – the set of norms that must be observed (regulatory norms, contractually norms, advisory norms).
   - Norm Authority Definition – the authority for each form is defined
   - Deontic Document Definition – all deontic documents that include defined norms

2) Rule Extraction – this is a *deontic logic format* representation of all deontic rules which are automatically extracted from one *deontic document*.

3) Project Information Extraction – represent the extraction of project information in the form of instance date of one deontic concept. The type of subject is important for the *compliance checking mechanism.* If the subject represents a *document* – text processing will be initiated.

4) Information Compliance Checking – consists of *Information Checking* process and *Compliance Checking Results Evaluation*. The compliance of a project's information will be checked against the deontic prescriptions and the results will be identified.

5) Consequence Definition – consists of two different types of consequences. The first type is the *deontic consequence* – the perfect consequence of compliance or non-compliance corresponding to the norms of the industry. The second type is the actual consequence that occurs and that may, or may not be this deontic consequence.

6) Compliance Checking Reporting – represents the results and all existing consequences of this compliance checking process.

Authorities

The type of authority depends on the jurisdiction, and also on the work nature.

- There is a *Regulatory Authority* it could be an issuing authority (state agency, local agency, corporate organization), a permitting authority (state agency, local agency), an enforcing authority (state agency, local agency, corporate organization).

- A *Contractual Authority* represents a project stakeholder that obtained the authority because of an agreement contracted between two or even more different parties.

Deontic Documents

Every *norm* is documented and described in a *deontic document*. The deontic document is classified based of its normative type.

- *Regulatory Document*: a document containing norms that are statutory (laws, regulations). There are specific requirements allowing distinguish what is legal and permissible.

- *Contractual Document*: a document including norms contracted from two or more parties (general conditions).

- *Advisory Practice Document*: a document containing the practices of the advisory.

Deontic Rules and Prescriptions

There are different numbers of criteria that specify a *deontic rule*:

1) Subject – project, actor, product

2) Topic – quality, cost, safety
3) Agent – owner, consultant
4) Norm – regulatory, advisory or contractual practice

Accordingly, there are a similar number of criteria for the *prescriptions*:

1) Subject – obligation, permission or prohibition by a subject
2) Agent – a deontic prescription stipulating permission, obligation, or prohibition of an agent
3) Topic
4) Norm

[19],[23],[28]

6.2. Deontic Axioms

Deontic axioms are specific for the appropriate deontic model. Their role is to define the concepts, relations and constraints in deontology. There are three main types:

- Modality Axioms: axioms specifying the criteria of a concept to its super-concept.
- Cardinality Axioms: axioms describing the restrictions on the number of values. One relation starts if this one behavior also between different concepts.
- Core Process Axioms: these axioms describe technical constraints with specific knowledge in construction domain.

[15]

MODALITY AXIOMS

1	It is obligatory that, a norm that originates from a regulatory authority is a regulatory norm.
	$\forall x,y\ (norm(x) \wedge regulatory\_authority(y) \wedge originates\_from(x,y)) \rightarrow \boldsymbol{O}\ (regulatory\_norm(x))$
2	It is obligatory that, a deontic document that documents a regulatory norm is a regulatory document
	$\forall x,y\ (deontic\_document(x) \wedge regulatory\_norm(y) \wedge documents(x,y)) \rightarrow \boldsymbol{O}\ (regulatory\_document(x))$
3	It is obligatory that, a statute that originates from federal agency is a federal agency.
	$\forall x,y\ (statute(x) \wedge federal\_agency(y) \wedge originates\_from(x,y)) \rightarrow \boldsymbol{O}\ (federal\_statute(x))$
4	It is obligatory that, a regulation that originates from federal agency is a federal agency.
	$\forall x,y\ (regulation(x) \wedge federal\_agency(y) \wedge originates\_from(x,y)) \rightarrow \boldsymbol{O}\ (federal\_regulations(x))$
5	It is obligatory that, a statute that originates from a state agency is a state statue.
	$\forall x,y\ (statute(x) \wedge state\_agency(y) \wedge originates\_from(x,y) \rightarrow \boldsymbol{O}\ (state\_statute(x))$
6.	If a deontic document originates from an authority, then it is obligatory that the authority is an issuing authority.
	$\forall x,y\ (deontic\_document(x) \wedge authority(y) \wedge originates\_from(x,y) \rightarrow \boldsymbol{O}\ (issuing\_authority(y))$

Table 4: Modality Axioms [15],[19]

CARDINALITY AXIOMS

1	It is permitted that a compliance assessor is responsible for more than one compliance checking process.
	$\forall x,y,z$ (compliance_assessor(x) $\wedge$ compliance_checking_process(y) $\wedge$ compliance_checking_process(z) $\wedge$ y $\neq$ z)) $\rightarrow$ ***P*** (administers(x,y) $\wedge$ administer(x,z))
2	It is obligatory for a compliance assessor to assess at least one compliance agent.
	$\forall x$ (compliance_assessors(x)) $\rightarrow$ ***O*** ($\exists y$ (compliance_agent(y) $\wedge$ asseses(x,y)))
3	It is forbidden for a compliance checking process to be administered by more than one compliance assessor.
	$\forall x,y$ (compliance_checking_process(x) $\wedge$ compliance_assessor(y) $\wedge$ administers(y,x) $\rightarrow$ ***F*** ($\exists z$ (compliance_assessor(z) $\wedge$ administers (z,x) $\wedge$ y $\neq$ z))
4	It is obligatory that a compliance checking process uses at least one compliance checking mechanism.
	$\forall x$ (compliance_checking_process(x)) $\rightarrow$ ***O*** ($\exists y$ (compliance_checking_mechanism(y) $\wedge$ uses(x,y)))
5	It is permitted for an authority to have authority over a compliance checking topic and/or a compliance checking applicability phase.
	$\forall x$ (authority(x)) $\rightarrow$ ***P*** ($\exists y,z$ (compliance_checking_topic(y) $\wedge$ compliance_checking_applicability_phase(z) $\wedge$ (has_authority_over(x,y) v has_authority_over(x,y) v has_authority_over(x,z)))
6	It is permitted for an authority to have authority over more than on compliance checking topic.
	$\forall x$ (authority(x)) $\rightarrow$ ***P*** ($\exists y,z$ (compliance_checking_topic(y) $\wedge$ compliance_checking_topic(z) $\wedge$ y $\neq$ z $\wedge$ has_authority_over (x,y) $\wedge$ has_authority_over (x,z)))
7	It is permitted that a subject has more than one compliance checking attributes.
	$\forall x$ (subject(x)) $\rightarrow$ ***P*** ($\exists y,z$ (compliance_checking_attribute(y) $\wedge$ compliance_checking_attribute(z) $\wedge$ y $\neq$ z $\wedge$ has_attribute(x,y) $\wedge$ has_attribute(x,z)))

Table 5: Cardinality Axioms [15],[19]

CORE PROCESS AXIOMS

1	There is an obligation that a compliance checking process is defined by its own compliance assessor if this checking process has also a compliance checking scope.
	$\forall x,y,z$ (compliance_checking_process(x) $\wedge$ compliance_checking_scope(y) $\wedge$ has_scope(x,y) $\wedge$ compliance_assessor(z) $\wedge$ administers(z,x)) $\rightarrow$ O (defines(z,y))
2	It is obligatory that, if a compliance checking process has a subject this subject is also defined by its own compliance assessor.
	$\forall x,y,z$ (compliance_checking_process(x) $\wedge$ subject(y) $\wedge$ is_checked_by(y.x) $\wedge$ compliance_assessor(z) $\wedge$ administers(z,x) $\rightarrow$ O (define(z,y))
3	If the subject of a compliance checking process is a resource then, it is obligatory that it is checked by a resource compliance checking process.
	$\forall x,y$ (subject(x) $\wedge$ resource(x) $\wedge$ compliance_checking_process(y) $\wedge$ is_checked_by(x,y) $\rightarrow$ O (resource_compliance_checking_process(y))
4	If a compliance assessor is also a compliance agent, then it is obligatory that he/she is a self-assessor.
	$\forall x,y$ (compliance_assessor(x) $\wedge$ compliance_agent(x) $\wedge$ compliance_checking_process(y) $\wedge$ administers(x,y) $\rightarrow$ O (self_assesor(x))
5	If a compliance assessor is not a compliance agent, then it is obligatory that he/she is an authority assessor.
	$\forall x,y$ (compliance_assessor(x) $\wedge$ ~compliance _agent(x) $\wedge$ compliance_checking_process(y) $\wedge$ administers(x,y)) $\rightarrow$ O (authority_assessor(x))
6	There is an obligation for every deontic document to originate from one issuing or contractual authority.
	$\forall x,y$ (deontic_document(x)) $\rightarrow$ O ($\exists y$ ((issuing_authority (y) v contractual_authority(y)) $\wedge$ originates_from(x,y)))
7	It is permitted for a compliance assessor, to also be a compliance agent, for the same compliance checking process (a compliance assessor is permitted to assess him/herself).
	$\forall x,y$ (compliance_assessor(x) $\wedge$ compliance_agent(x) $\wedge$ compliance_checking_process(y)) $\rightarrow$ P (administers(x,y) $\wedge$ assesses(x,x))

Table 6: Core Process Axioms [15],[32]

CHAPTER 4: Examples

1. Rules for the development and further modification of banking products and services

1.1 General Provisions

Section I. General provisions

(1) These Rules for the development and modification of banking products and services (the Rules) are governed by, and reflect the rules and requirements of current legislation. These Rules are compliant with Regulation (EU) No 575/2013 of the European Parliament and also of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.

(2) These Rules have been adopted following the relevant internal procedures and regulations of the Bank.

Section II. Definitions

(1) A "new banking product or service" shall mean a product, service or distribution channel which is not currently listed in the Product catalog of the Bank.

(2) A modification of a product or service shall mean changing at least one parameter of an existing product, service or distribution channel, or change in the source of funding.

(3) A product or service shall mean any credit, deposit, savings, payment or card product, as well as any payments, cash transactions, documentary transactions, checks, treasury products, bank insurance products, investment products, asset management, mediation, packages, factoring, investment gold and diamonds, sales distribution channels, and other services that the Bank offers to its clients under the Product catalog.

(4) A one-time product shall mean a product that is developed under specific parameters, for a particular client of the Bank, is only applied once and is not regulated by the current internal bank regulations.

[27],[28]

1.2. Principles and stages of the processes of development of new, or modification of existing products or services

Section III. Stages of the processes of development of new, or modification of existing products or services

(1) The process of development of new services and products includes the following stages:

- Origination of an idea by the initiating structural unit;
- Development and coordination with the responsible units involved in the process of development of new product in the Bank;
- Approval by the competent bodies of the Bank;
- Testing of the electronic systems and applications;
- Training;
- Marketing and advertising;
- Implementation of the product in the branch network of the Bank;
- Monitoring.

(2) The standard process for one-time product, service or transaction with individual parameters includes the following stages:

- Origination of an idea;
- Development and coordination with the responsible units involved in the process of product development in the Bank;
- Approval by the competent bodies of the Bank;
- Testing of the electronic systems and applications – if necessary;
- Monitoring.

(3) ***Modifying*** of existing products or services includes the following stages:

- Development;
- Coordination with the responsible units involved in the process of product modification in the Bank;
- Approval by the competent bodies;
- Testing of the electronic systems and applications – in case the modification requires change in the banking information system and the other electronic applications;
- Training – in case the modification requires special training;
- Marketing and advertising – if applicable;
- Implementation of the modification in the branch network of the Bank;
- Monitoring.

Section IV. Principles

(1) The structural unit which initiates the development and creation of a new banking product or service, or even the modification of an old one, shall coordinate the process of development, approval and implementation of the respective product/service.

(2) Owner of a given product/service shall be the structural unit which is responsible for the respective product/service. The initiating structural unit may differ from the owning structural unit.

(3) Any proposal for a new or modified product/service shall be coordinated in order to ensure their compliance with the risk and business strategy; assess the main risks associated with IT, accounting, taxation, human resources, organization, as well as the overall, market, operational, liquidity, foreign exchange, interest rate, and reputational risk; ensure compliance with the internal and external regulatory requirements; define the needs for changes or updates in the relevant internal bank regulations and systems, and the timeframe for implementation.

(4) The structural units in the Bank which initiate new banking products or services shall consider the ethical and reputational aspects of new product development, thus facilitating the expansion of the business potential, while minimizing the liability risk, credit risk, and reputational risk.

(5) The process of development of new or modification of existing banking products and services shall apply to all business segments and units of the Bank.

(6) Any new or modified product shall be approved by the relevant competent body.

(7) At the development stage, the IT unit shall prepare a technological description of the banking product or service: nomenclature codes used for identification, technology used for interest accrual, or other specialized application settings in connection with the operation of the product.

(8) Any updates in the banking information system and the electronic applications related to the operation and reporting of different products and services shall be subject to preliminary testing. Introduction of changes in the actual banking information system shall only be done after signing of a protocol between the structural unit having carried out the tests and the structural unit which is responsible for the IT implementation.

Section V. Structural units – owners and coordinators

(1) The structural unit owning the respective product/service shall initiate the development of new, or modification of existing products and services.

(2) In certain specific cases it shall be permissible that the initiator of a new or modified product/service is a structural unit different than the unit owning the respective product/service.

(3) The process of coordination when implementing a new or modified product or service shall necessarily require participation of the units responsible for:

- assessment of credit, market, operational, interest rate, currency, liquidity, reputational risk;
- assessment of the risk of money laundering or fraud;
- assessment of the need for development of new, or change in the existing accounting methodology; assessment of tax implications;
- assessment of compliance of the proposal for a new or modified product with the budget framework;
- assessment of the compliance with the current external and internal regulations, and coordination of time limits for making changes to the applicable regulatory documents, including the Tariff of fees and commissions of the Bank and the Bulletin of interest rates, where necessary;
- compliance with existing legal framework;
- investigation and analysis of the potential customers and markets for offering the new product or service;
- assessment of the possibility for technical realization of the product or service in the information systems of the Bank.

(4) In the coordination of new, or modifying of existing credit products, the lending units shall also participate.

[10],[13]

2. Process of creation, approval and implementation of new banking products

Section VI. Origination of an idea for a new product or service

(1) Upon origination of an idea for a new product or service, the structural unit (hereinafter referred to as the Initiator) in whose scope the product/service falls, shall collect information about the parameters of similar products offered by competitor banks in the market, and make a preliminary assessment of the regulatory environment.

(2) In parallel with the research of the Initiator, the marketing unit shall perform a detailed study of the market and the customer needs, possibly interviewing clients or focus groups if the product/service is complex or radically innovative and no other source of information is available.

(3) The Initiator shall collect and analyze all the information available.

(4) Based on the analyzed information the Initiator shall prepares a **Product Card** for the new product or service describing its parameters, pricing, target customer groups, cross selling

products, etc. /*Appendix 1*/. Adding of new sections or modifying the product card shall be allowed in case of relevant product-specific information. Attached are recommended samples of product cards.

(5) The Initiator shall also prepare a **Business Case** /*Appendix 2*/ including:

- analysis of the pricing of the new product using data from existing products;
- projections on the number of customers, their behavior, and expected revenues;
- rationale for the proposed product/service;
- benefits, risks of the product or service, costs. The analysis of the product/service should cover all positive and negative aspects, emphasizing on the analysis of risk factors;
- comparison with products/services of competitor banks if such analysis is possible.

(6) The Initiator shall coordinate the product idea with the line Executive Director who shall:

- Require additional research/analysis, respectively changes to the parameters of the product/service; or
- Gives a positive opinion on the proposed product/service.

(7) Upon positive opinion by the responsible Executive Director, the Initiator shall prepare a Proposal to the relevant competent body with a view to principle approval of the idea for the new product/service.

[10],[11]

Section VII. Development and coordination of the new product/service

(1) Upon principal approval by the competent body, the Initiator shall coordinate the product or service with the structural unit responsible for the process of implementation of the product or service in the Bank.

(2) The Initiator shall send the **Product Card** and the **Business Case** by email for coordination to the Heads of the structural units concerned, or to their designated officers from the respective units, depending on the type of product/service.

(3) Within 3 /three/ working days the units under the preceding paragraph shall review the documents received by the Initiator and return by e-mail an opinion on the proposed product/service. The IT unit shall give an opinion on the technological possibility for realization.

(4) Where there is no agreement on some of the parameters of the product/service, the Initiator shall organize a meeting between the units concerted for reaching of agreement on the outstanding issues. If such agreement results in a substantial change in some parameters of the product/service, the Initiator shall update the Product Card (the Business Case, if necessary) and send it back to the units for subsequent coordination.

(5) The Initiator shall be responsible for drawing up minutes of the conducted meetings relating to the development and coordination of the product/service.

(6) In the event that the anti-money laundering, risk management, or legal units give an opinion that the product is not in compliance with the policies of the Bank on prevention of terrorist financing, money laundering, with its risk strategy, and/or with the existing regulations, the process of development and implementation of the product shall be discontinued. In case of recommendations being made, those should be fulfilled before implementation, or within the periods prescribed.

(7) If, after agreeing the parameters, a significant IT development is required in order to implement the product/service, the Initiator shall prepare a Change Request describing all electronic systems and interfaces affected.

Section VIII. Approval by the competent body

(1) After coordinating the Product Card and the Business Case and obtaining an opinion from the responsible units, the Initiator shall prepare a Proposal to be approved by the competent body.

(2) Based on the agreed Product Card, the relevant responsible unit shall prepare the necessary documents for the respective product/service (Rules, sample forms, instructions, contracts, annexes, etc.) and coordinate them.

(3) The structural unit owning the product/service shall prepare a letter of notification to the structural units which are to offer the product/service.

(4) The IT unit shall prepare the Operating procedures for the product/service in the relevant information systems and electronic applications.

(5) The accounting unit shall prepare the accounting methodology for the product/service if necessary, also determining the accounts on which the product/service transactions shall be booked, and the fees and commissions collected.

(6) The Initiator shall submit the Proposal, the Product Card, the Business Case, the General Terms, and the Rules for approval by the competent body.

(7) The competent body shall take a decision on the Proposal for a new banking product/service by:

- accepting the proposed parameters without modification; or
- accepting the new product/service in principle, modifying some of the proposed parameters.

(8) Upon receipt of instructions to modify some of the documents, the unit which has originated them shall make the relevant changes.

(9) Upon receipt of approval and completion of the preparations for introduction of the product/service, the letter of notification and the approved documents shall be published on the internal website of the Bank for information of the structural units concerned.

(10) The relevant responsible unit shall update the Tariff of fees and commissions, the Bulletin of interest rates, and the Product catalog published on the internal website of the Bank.

Section IX. Testing of the new product/service

(1) The IT unit shall perform testing of the new product. If problems arise during testing, the product shall be returned to the stage of IT development.

Section X. Training for work with the new product/service

(1) If training of the staff who will offer the new product/service is required, the Initiator shall prepare explanatory materials and, in conjunction with the HR Department, create a schedule and conduct/organize the training.

Section XI. Marketing and advertising

(1) The Initiator and the marketing unit shall jointly prepare and implement the advertising strategy for the new product/service in accordance with all parameters approved by one competent body.

(2) The marketing unit shall develop a promotional program and advertising materials for the new product/service, and publish an advertising banner for the new product/service on the corporate website of the Bank.

[10],[11]

Section XII. Monitoring

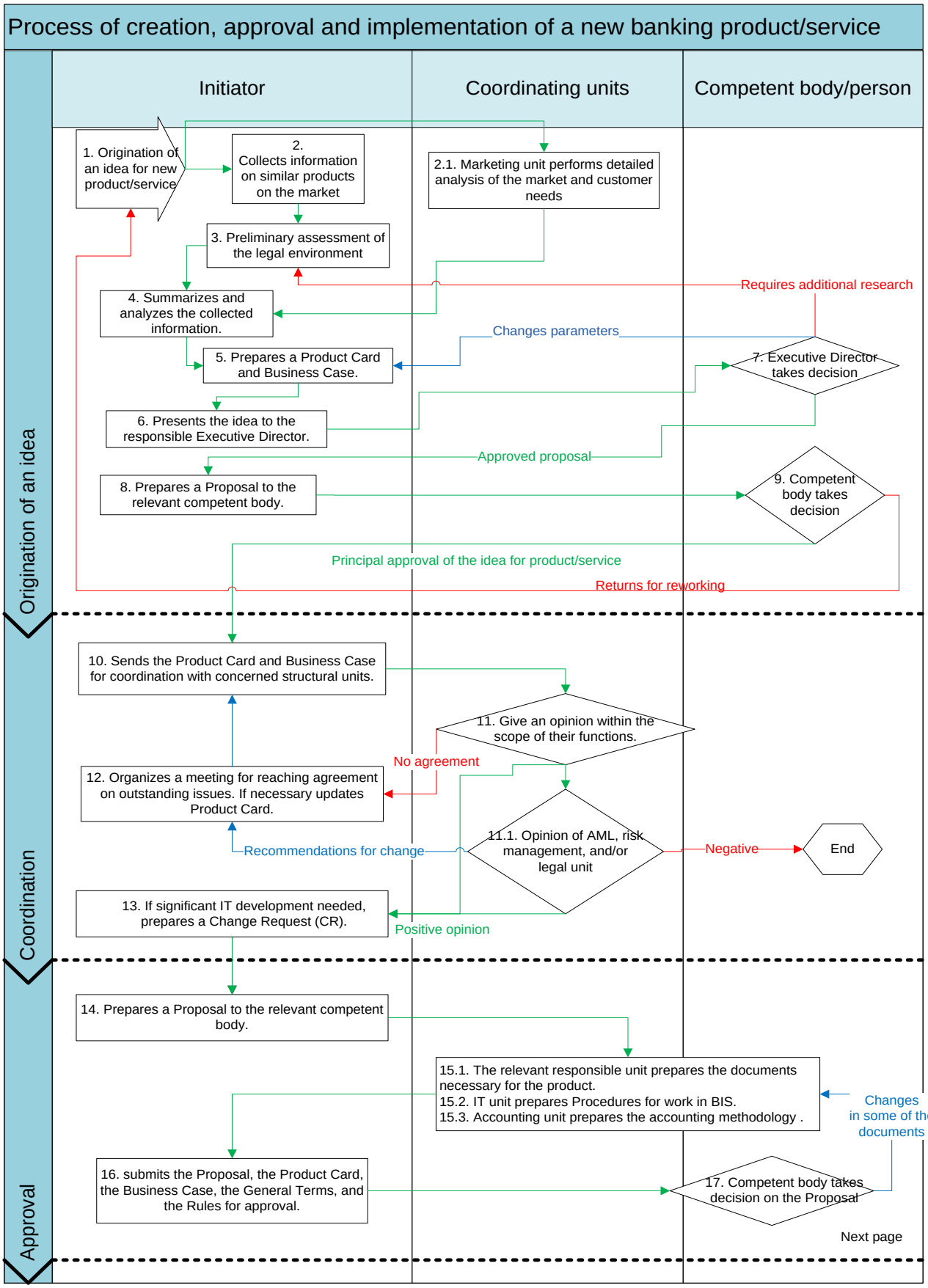
(1) Upon implementation of a new or modified product/service, the structural unit which owns it shall prepare an analysis of the results against the forecast included in the business rationale 6 (six) months after implementation, and submit a proposal for its continuation, change, or removal from the product list of the Bank. The necessary information may be collected through the reporting system of the Bank, other software applications, or specific reports on the profitability of the product provided by the finance unit (interest income/expense realized, fees and commissions, etc.).

(2) The risk management unit shall exercise subsequent control of the portfolio quality of new credit products.

(3) The risk management unit may submit proposals to the relevant competent body for adjustment of the pricing of products in cases where the price does not adequately reflect the Bank’s business model, or risk strategy.

(4) The finance unit shall exercise subsequent control of the portfolio profitability of new products.

(5) The relevant responsible units shall monitor the regulatory compliance of the product/service.


Process of creation, approval and implementation of a new banking product/service
Initiator
Coordinating units
Competent body/person
Origination of an idea
Coordination
Approval
1. Origination of an idea for new product/service
2. Collects information on similar products on the market
2.1. Marketing unit performs detailed analysis of the market and customer needs
3. Preliminary assessment of the legal environment
Requires additional research
4. Summarizes and analyzes the collected information.
Changes parameters
5. Prepares a Product Card and Business Case.
7. Executive Director takes decision
6. Presents the idea to the responsible Executive Director.
Approved proposal
8. Prepares a Proposal to the relevant competent body.
9. Competent body takes decision
Principal approval of the idea for product/service
Returns for reworking
10. Sends the Product Card and Business Case for coordination with concerned structural units.
11. Give an opinion within the scope of their functions.
No agreement
12. Organizes a meeting for reaching agreement on outstanding issues. If necessary updates Product Card.
11.1. Opinion of AML, risk management, and/or legal unit
Negative
End
Recommendations for change
13. If significant IT development needed, prepares a Change Request (CR).
Positive opinion
14. Prepares a Proposal to the relevant competent body.
15.1. The relevant responsible unit prepares the documents necessary for the product.
15.2. IT unit prepares Procedures for work in BIS.
15.3. Accounting unit prepares the accounting methodology .
Changes in some of the documents
16. submits the Proposal, the Product Card, the Business Case, the General Terms, and the Rules for approval.
17. Competent body takes decision on the Proposal
Next page

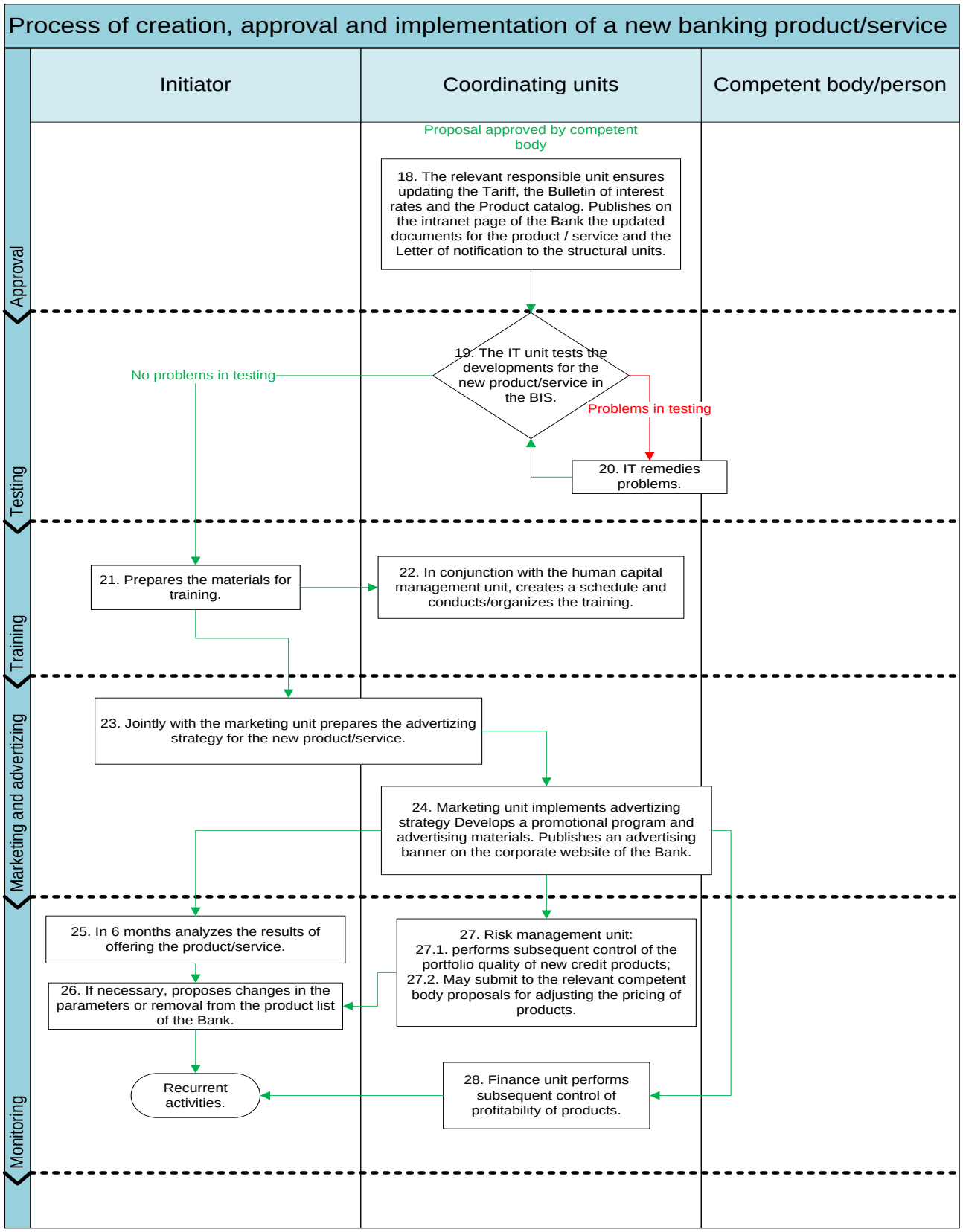


Figure 18: Process of creation, approval and implementation of new banking products/services [own source]

2.1. Deontic expression of the processes of development of new, or modification of existing products or services

ps = new product/service

sp = similar products

le = legal environment

i = collected information

pc = product card

bc = business case

p = proposal

a = agreement

cr = change request

pr = proposal

d = document

p = procedure

am = accounting methodology

gt = general terms

r = rule

dc = decision

nd = new document

t = training

as = advertising strategy

res = results after 6 months

por = portfolio quality

pp = profitability of the product

pri = price

Process of creation, approval and implementation of a new banking product/service

If *ps* → ***OB*** (collect (*sp*)) → ***OB*** (assessment(*le*)) → ***OB*** (summarize (*i*))

∀*i* → ***OB*** (prepare(*pc*) ∧ prepare(*bc*)) → ***OB*** (present(*i*))

If *i* → **PM** (prepare(*p*))

If ~*i* → ***OB*** (assessment(*le*))

If *p* → OB (send(*pc*) ∧ send (*bc*)) → OB (opinion (*a*))

If OB (opinion(*a*)) → OB(AML(*a*)) ∨ OB(meeting(*a*)) → PM (update(*pc*))

If ~OB (opinion(*a*)) → OB(meeting(*a*)) → PM (update(*pc*)) → OB (send(*pc*) ∧ send (*bc*))

If AML(*a*) → **PM** (prepare(*cr*))

If ~AML(*a*) → IM (creation(*ps*))

If *cr* → OB(prepare(*pr*))

If *pr* → OB(prepare(*d*)∧ prepare(*p*)∧ prepare(*am*)) → **OB** (submit(*pr*) ∧ submit(*pc*) ∧ submit(*bc*) ∧ submit(*gt*) ∧ submit(*r*) → **OB** (takes(*dc*))

If *dc* → **OB** (updating(*d*) ∨ publishing(*nd*)) → **OB** (testing(*nd*)

If~*dc* →OB(prepare(*d*)∧ prepare(*p*)∧ prepare(*am*)) → **OB** (submit(*pr*) ∧ submit(*pc*) ∧ submit(*bc*) ∧ submit(*gt*) ∧ submit(*r*) → **OB** (takes(*dc*))

If *nd* → OB (prepare(*t*)) →**OB** (organize(*t*) ∧ (prepare(*as*)) →**OB** (implement (*as*) ∧ publish (*as*) →**OB** (analyze(*res*) ∧ (**OB** (control(*por*) ∧ **PM** (adjust(*pr*)) ∧ **OB** (control (*pp*)) → **OB** (recurring(*nd*))

If ~*nd* → **OB** (testing(*nd*))

If analyze(*res*) → **PM** (change(*ps*)) → **OB** (recurring(*nd*))

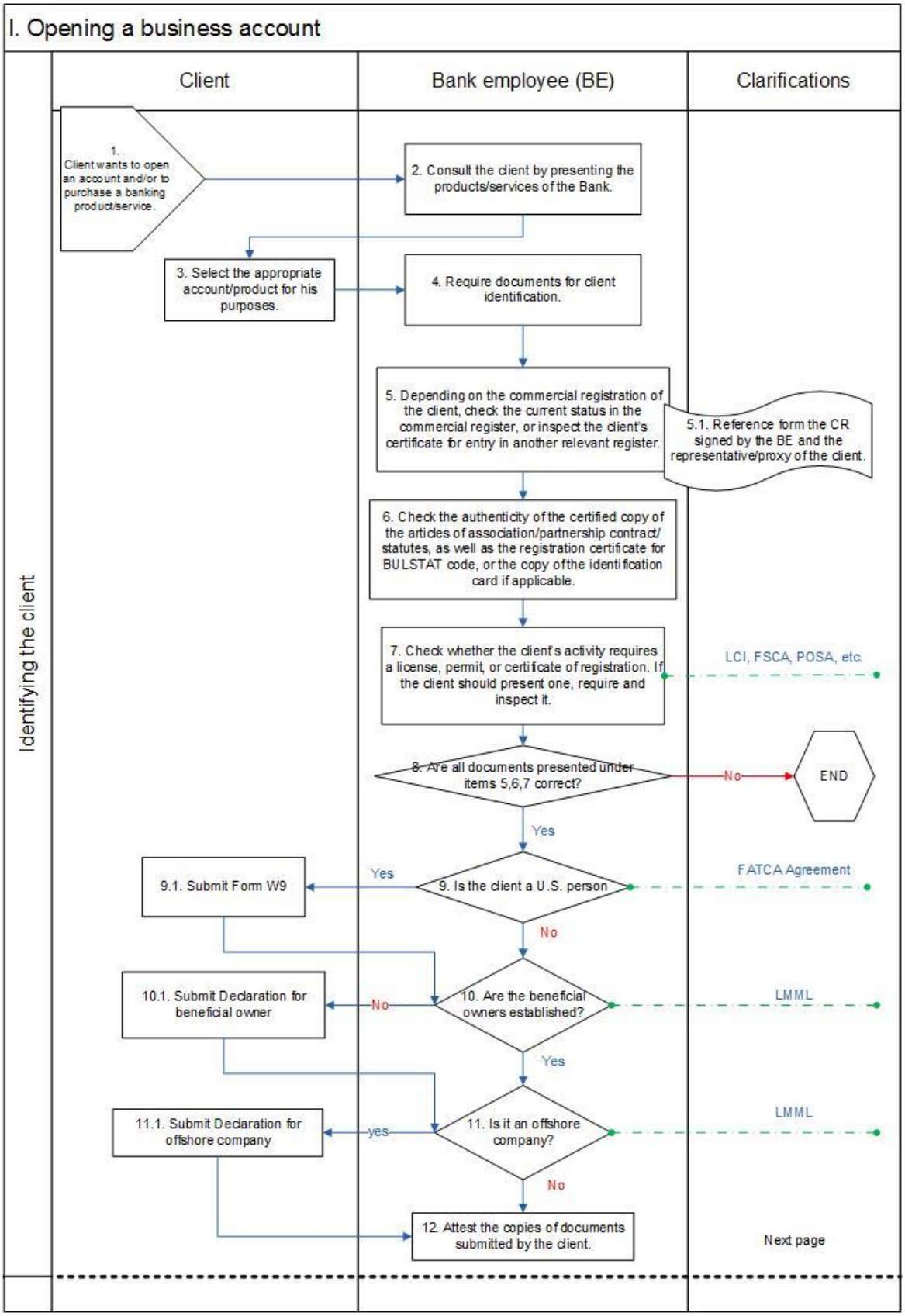
If **OB** (control (*pp*)) → **OB** (recurring(*nd*))

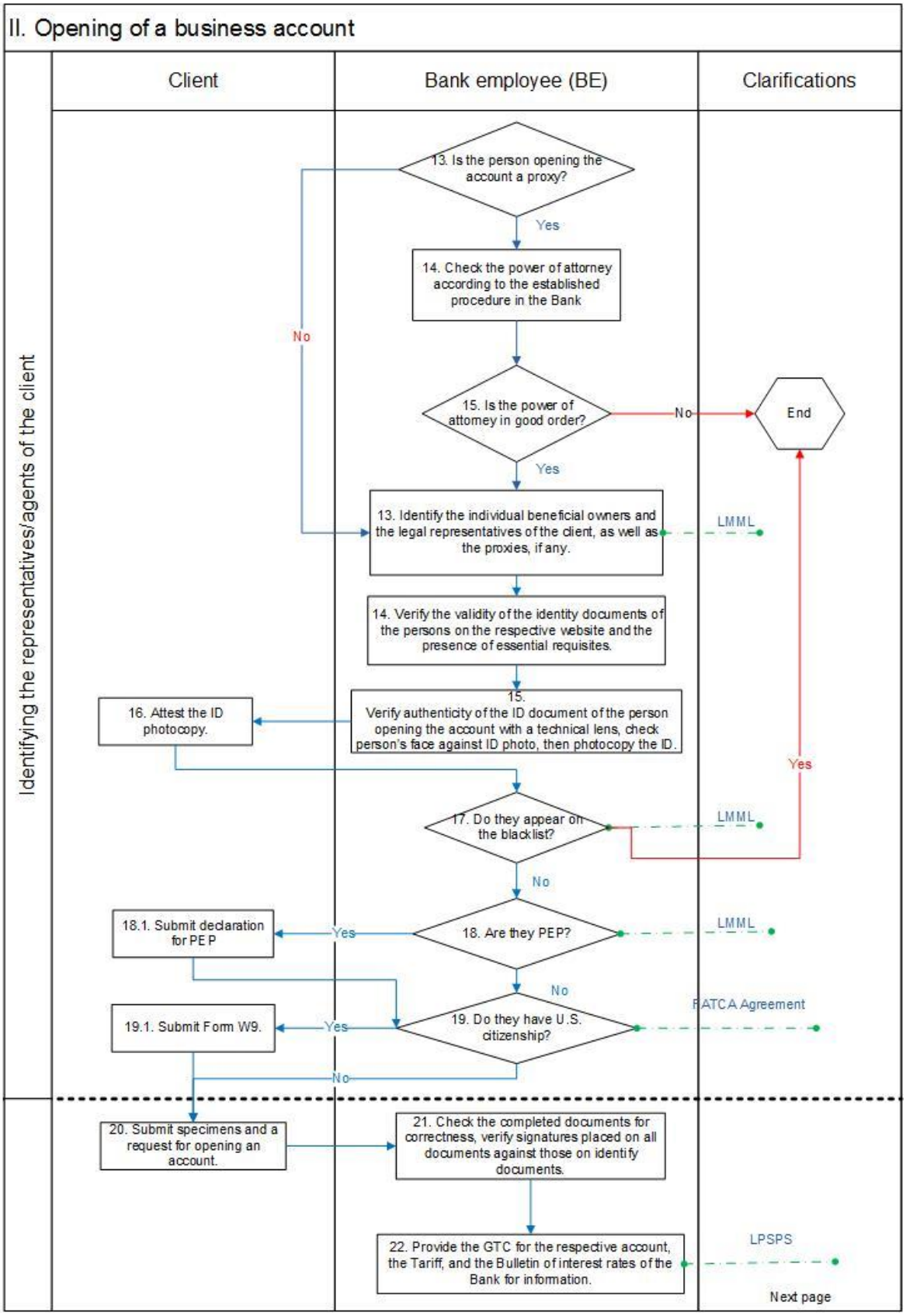
3. Opening a business bank account

The following example illustrates checking for compliance when opening a business bank account with the relevant required documents.

Norm
Opening a business bank account
Deontic Document
Document for opening a business bank account
Deontic Rule
All requirements should be completed and permitted in order to open a business bank account.
Deontic Prescription
$\forall x,p,cd,sd,d1,d2$ (opening_document(x) ∧ project(p) ∧ belongs_to(x,p) ∧ completion_date(cd) ∧ start_date(sd) ∧ has_attribute(x, cd, $d1$) ∧ has_attribute(p, sd, $d2$)) → O (greater_than($d2$, $d1$))
Project Information
Start date: 12/01/2015 End date: 12/01/2015
Project Information in Formal Logic
opening_document ($d1$) project ($p1$) belongs_to ($d1$, $p1$) completion_date ($cd1$) start_date ($sd1$) has_attribute ($d1$, $cd1$, 12/01/2015) has_attribute ($p1$, $sd1$, 01/01/2015)
Compliance Checking Result
Compliant

Table 7: Document requirements [own source]


I. Opening a business account
Client
Bank employee (BE)
Clarifications
Identifying the client
1. Client wants to open an account and/or to purchase a banking product/service.
2. Consult the client by presenting the products/services of the Bank.
3. Select the appropriate account/product for his purposes.
4. Require documents for client identification.
5. Depending on the commercial registration of the client, check the current status in the commercial register, or inspect the client's certificate for entry in another relevant register.
5.1. Reference form the CR signed by the BE and the representative/proxy of the client.
6. Check the authenticity of the certified copy of the articles of association/partnership contract/ statutes, as well as the registration certificate for BULSTAT code, or the copy of the identification card if applicable.
7. Check whether the client's activity requires a license, permit, or certificate of registration. If the client should present one, require and inspect it.
LCI, FSCA, POSA, etc.
8. Are all documents presented under items 5,6,7 correct?
No
END
Yes
9. Is the client a U.S. person
Yes
9.1. Submit Form W9
FATCA Agreement
No
10. Are the beneficial owners established?
No
10.1. Submit Declaration for beneficial owner
LMML
Yes
11. Is it an offshore company?
yes
11.1. Submit Declaration for offshore company
LMML
No
12. Attest the copies of documents submitted by the client.
Next page


II. Opening of a business account
Client
Bank employee (BE)
Clarifications
Identifying the representatives/agents of the client
13. Is the person opening the account a proxy?
Yes
No
14. Check the power of attorney according to the established procedure in the Bank
15. Is the power of attorney in good order?
No
End
Yes
13. Identify the individual beneficial owners and the legal representatives of the client, as well as the proxies, if any.
LMML
14. Verify the validity of the identity documents of the persons on the respective website and the presence of essential requisites.
15. Verify authenticity of the ID document of the person opening the account with a technical lens, check person's face against ID photo, then photocopy the ID.
16. Attest the ID photocopy.
Yes
17. Do they appear on the blacklist?
LMML
No
18.1. Submit declaration for PEP
Yes
18. Are they PEP?
LMML
No
19.1. Submit Form W9.
Yes
19. Do they have U.S. citizenship?
FATCA Agreement
No
20. Submit specimens and a request for opening an account.
21. Check the completed documents for correctness, verify signatures placed on all documents against those on identify documents.
22. Provide the GTC for the respective account, the Tariff, and the Bulletin of interest rates of the Bank for information.
LPSPS
Next page

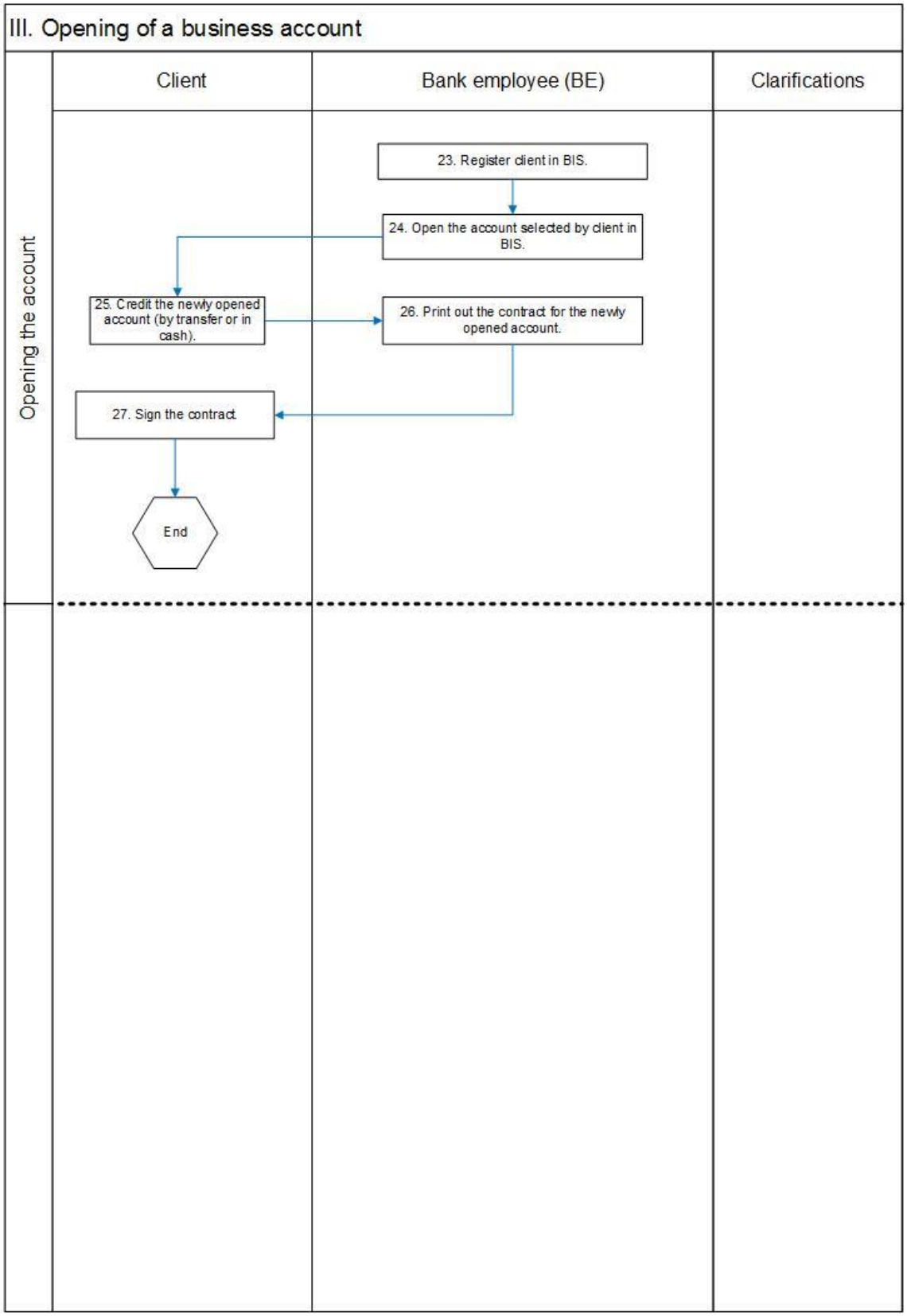


Figure 19: Opening a business bank account [own source]

3.1. Deontic expression for opening a business bank account

Client wants to open an account and/or to purchase a banking product/service.

c = clients

cc = clients contract

x = new account

ps = new product/service

r = requirements (documents)

n = nationality U.S.

sf = submit form W9

bo = beneficial owner

oc = offshore company

er = essential requisites

id = ID document

d = document

bl = black list

pep = PEP

w = form W9

s = signatures

t = Tariff

b = bulletin of FX rates

pp = proxy person

p = proxy

pa = power of attorney is good

ow = owners

lr = legal representatives

v = validity

Identifying the client

∀*x*, *ps* (opening_account(*x*) ∧ purchase_product (*ps*)) → ***OB*** (requirements(*r*))

If *r* → *n*

If ~*r* → ***IM*** (*x* ∧ *ps*)

If *n* → **OB** (submit_form (*sf*) → **OB** (ben_owners (*bo*))

If ~*n* → **OB** (ben_owners (*bo*))

If has_established (*bo*) → ***OB*** (off_company (*oc*))

If ~ has_established (*bo*) → ***OB*** (submit_declaration (*bo*)) → ***OB*** (off_company (*oc*))

If *oc* → ***OB*** (submit_declaration (*oc*)) → ***PM*** (has_documents (*c*))

If ~*oc* → ***PM*** (has_documents (*c*))

Identifying the representatives/agents of the client

If *pp* → ***OB*** (check (*pa*)).

If *pa* → ***OB*** (has_identified (*ow*) ∧ has_identified (*lr*) ∧ has_identified (*p*) → ***OB*** (has_verified (*v*) ∧ has_verified (*er*)) → ***OB*** (has_verified (*id*)) → ***OB*** (has_attested(*id*)).

If ~*pp* → ***OB*** (has_identified (*ow*) ∧ has_identified (*lr*) ∧ has_identified (*p*) → ***OB*** (has_verified (*v*) ∧ has_verified (*er*)) → ***OB*** (has_verified (*id*)) → ***OB*** (has_attested (*id*)).

If ~*pa* → ***IM*** (*x* ∧ *ps*).

If *bl* → ***IM*** (*x* ∧ *ps*).

If ~*bl* → ***OB*** (has_identified (*pep*)).

If *pep* → ***OB*** (submit_declaration (*pep*)) → ***OM*** (*n*).

If ~*pep* → ***OB*** (*n*).

If *n* → ***OB*** (has_submitted (*w*)) → ***OB*** (has_submitted_request(*x*)) → ***OB*** (has_checked_completeness (*d*) ∧ has_verified (*s*)) → ***OB*** (has_provided (*t*) ∧ has_provided (*b*)).

If~ *n* → ***OB*** (has_submitted (*w*)) → ***OB*** (has_submitted_request(*x*)) → ***OB*** (has_checked_completeness (*d*) ∧ has_verified (*s*)) → ***OB*** (has_provided (*t*) ∧ has_provided (*b*)).

Opening the account

OB (has_registered (*c*)) →***OB*** (has_opened (*x*)) →***OB*** (has_credited (*x*)) →***OB*** (has_printed (*cc*)) →***OB*** (has_signed (*cc*)).

CHAPTER 5: Business Process Modeling Notation and the Deontic Logic

1. BPMN methodology

Business Process Modelling Notation (BPMN) is a standard for modelling and development of business processes. The possibility of modelling using BPMN is important and one of the easiest ways of process description and simulation. Models expressed with BPMN are understandable for different consultants, technical developers and business analysts and no special technical skills are required. BPMN models also present the entire information necessary for development of all IT supporting services. They are graphical representations for modelling business processes with five different basic elements: data, flow objects, artifacts, swim lanes and connecting objects. The activities in BPMN are obligatory and if anything is optional, the process flow is split using a gateway in order to give the option to execute the task or not.

[22],[23]

BPMN Notation

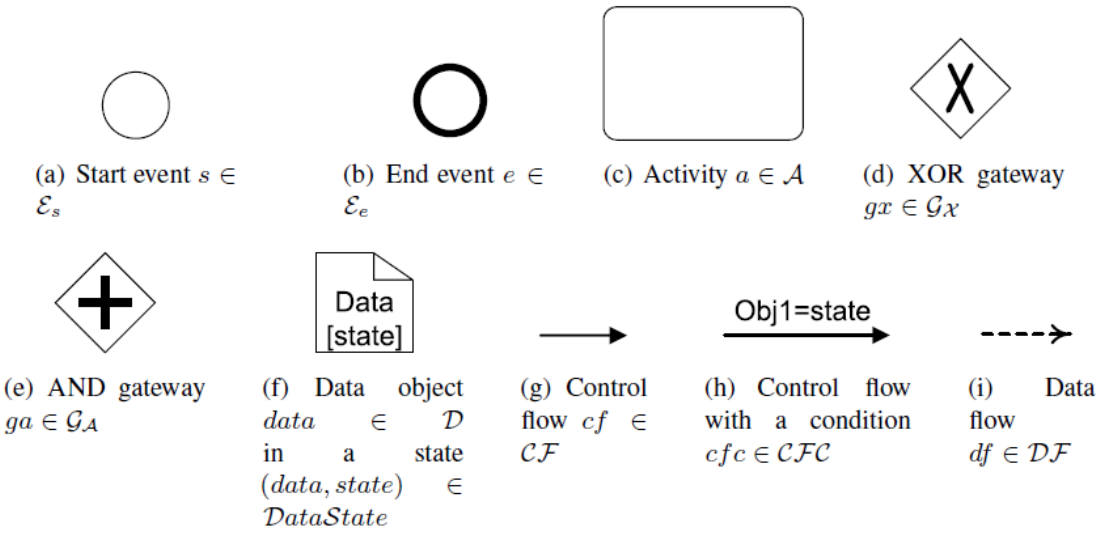


Figure 20: BPMN process modeling constructs [33]

2. BPMN & Deontic Model advantages and disadvantages

2.1. Advantages

Deontic Logic

Deontic Logic has been created as a study of different normative concepts. It can be described as a modal logic of permission and obligation. There are several advantages using this type of logic for expressing business processes in compliance management.

- Using Deontic Logic normative concepts can be described as Obligation (O), Permission (P), Prohibition (F) – must, ought and can.
- This kind of logic is very popular in business organizations, security systems and compliance management because it gives the possibility to express clear regulations.
- Decision and action timeframe – using DL norms decreases time duration. Decisions are taken faster. Realization of business processes is streamlined and execution of the tokens is clear.
- Readability limitations do not occur – it is easier to make the difference between permission, obligation and optionality of the task. There are no 'obligation conflicts'. Only one token is obligatory and will be executed.
- Input & Output deontic logic rules provide a useful tool for clarifying, analyzing and solving problems, executing tasks, and realizing processes in compliance management.

[28],[31]

BPMN model

The BPMN model is a process commonly used in process modelling. Such kind of standard has been introduced and maintained by OMG (Object Management Group) and is specially addressed to business analysts and project managers.

- The BPMN model and notation are easy to understand. There is no specific knowledge required and the workflow process with its decisions is easily accessible.
- The style of semantic representation is easy to study and use. Again, no specific knowledge is required.

2.2. Disadvantages

Deontic Logic Problems

- Norm compliance problem – it is challenging to find the logic of normative concepts to begin with. The usage of norms in not normally 'true' or 'false'. The description is usually not that clear, while they allow or demand certain kind of behavior.
- Norm usability – is not as easily understandable as the BPMN notation. The normative system is more coherent.
- No connection between normative systems, ontologies, compliance tools and business processes notation. To combine all norms and business processes, Business Rules and Business Vocabulary are created.
- The ought-operator is ambiguous – it is not always clear when taking a decision, to determine who is the 'ought' operator – '*…ought to be the case'*.
- The style of semantic representation needs some knowledge in order to be understood.

[29]

BPMN Problems

The activities in the BPMN model are obligatory and if one task is optional, the process flow should be split in two different tasks: one of them to be executed, and the other not.

The execution and non-execution are separated, therefore the following problems occur:

- Readability limitations – It is not easy to distinguish between the different tasks of obligation, permission and optionality. There are 'obligation conflicts'.
- Structural complexity – to express modality, additional tasks and elements are needed which leads to complicate structure of the workflow.
- Activity duplication – duplication of activities can occur because of various normative concepts affecting the same task.
- Decision and action timeframe – when using the BPMN model without DL, decisions are taken slower, execution of tasks is delayed and time constraints occur.

[23],[24]

Overview of DL advantages and disadvantages:

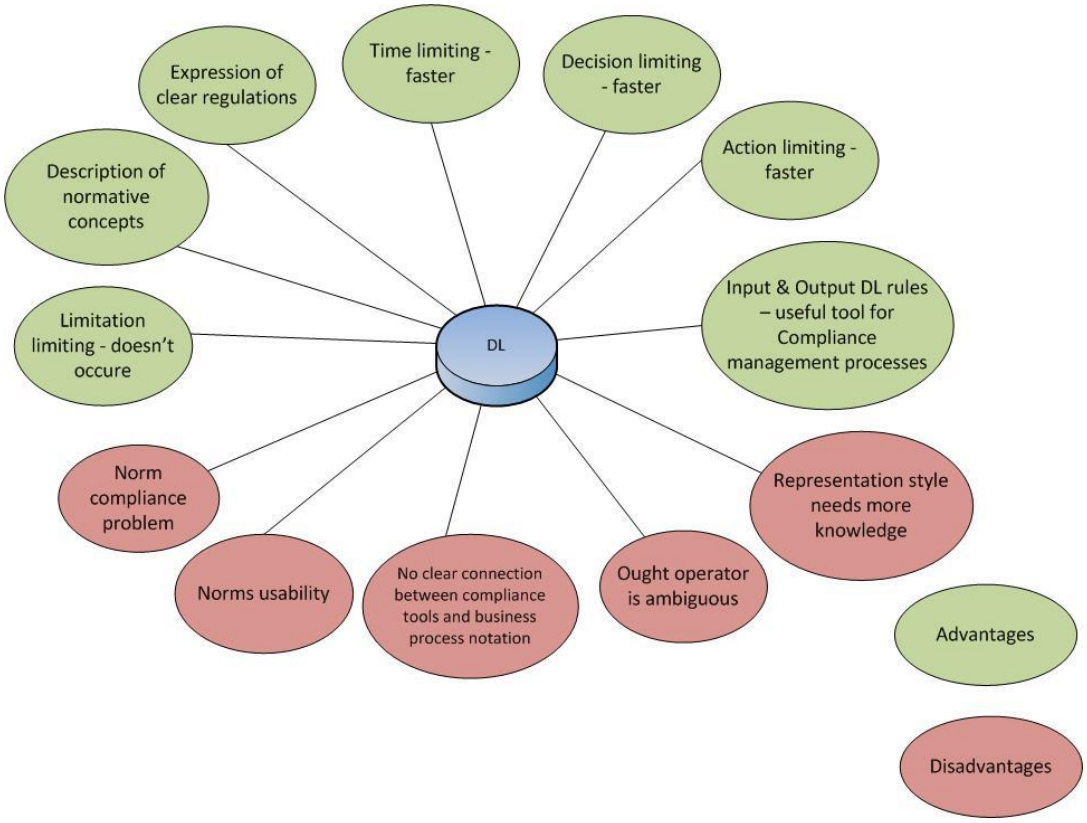


Figure 21: DL advantages and disadvantages [own source]

Overview of BPMN advantages and disadvantages:

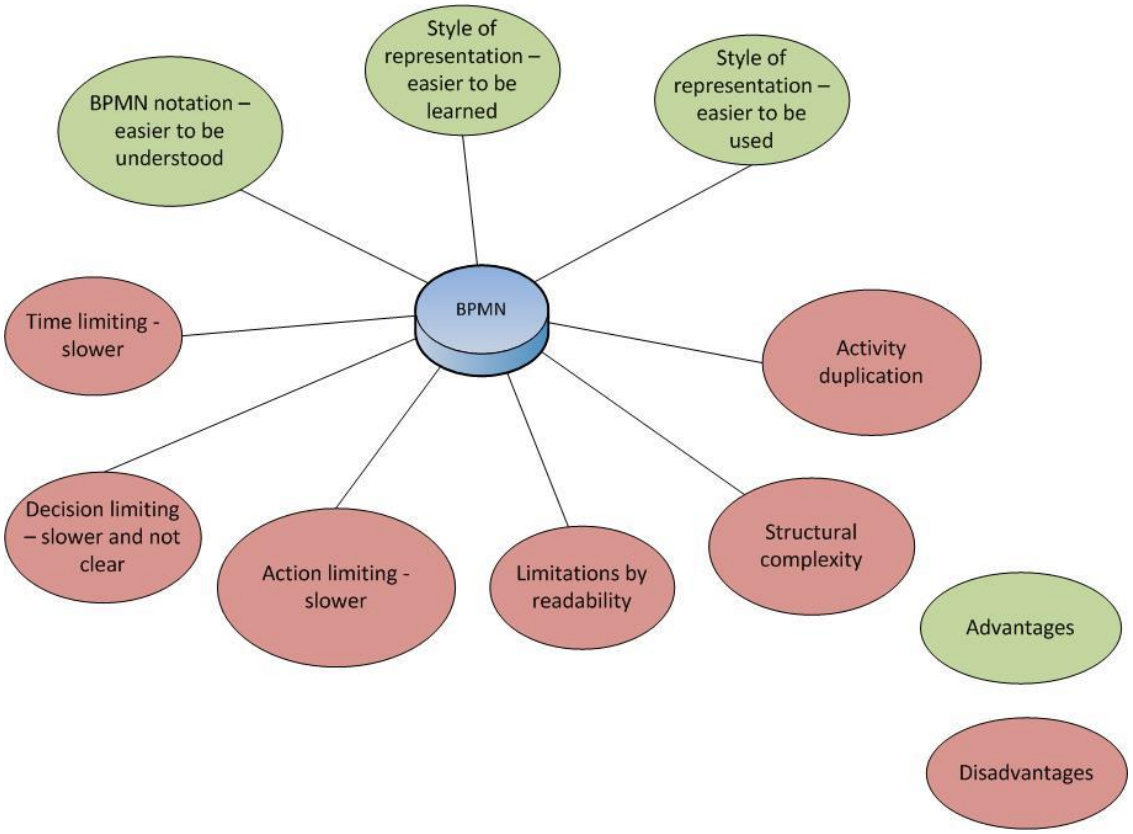


Figure 22: BPMN advantages and disadvantages [own source]

3. Deontic BPMN

One of the main purposes of combining the BPMN and Deontic model expressions is to be able to express optionality, permission and obligation (*Figure 23*) more easily, and without duplications of tasks. The clarity and usability of the diagrams is improved, and the process duration is shortened. Permitted and obligatory activities are mainly used in this process description. The combination with Deontic Logic reduces the number of all gateways and their sequence flows, and gives a clear view of the rights and their obligations.

[31]

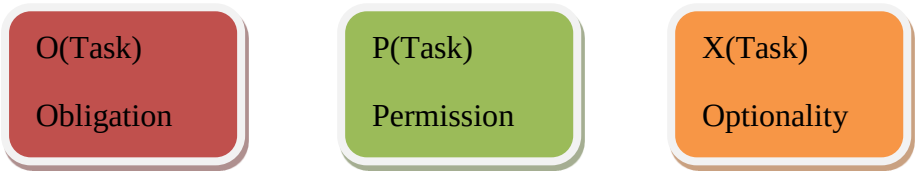


Figure 23: Deontic activities [24]

The usage of colors is suggested by D.L. Moody as the most cognitively effective of all other possible visual variables.

Graph Transformation and Algebraic approach

Applying a new rule *r* on a given graph *L* using the algebraic method, a new graph *R* is transformed. *Figure 24* introduces the transformation of graph *L* to graph *R* with a given rule *r = (L, R)*. The new graph R represents the old one, replacing *L* by *R* in case of matching.

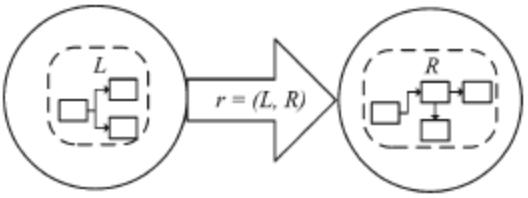


Figure 24: Rule-based approach [23, 24]

Empty Task

A new empty task *Phi* ϕ is represented in order to specify the alternative to do nothing. In a parallel gateway if a *Phi* ϕ task is removed, then the following gateways can also be removed. The other paths included in a parallel gateway are in this case obligatory.

If we have a *Phi* Branch in a parallel gateway then this ϕ –branch should be ignored. The following paths in the workflow are obligatory 'O (…)'.

$$A \wedge \phi = A \quad \Rightarrow \quad A \wedge B \wedge \phi = A \wedge B$$

[22]

Permission and Alternative tasks

The expression of permission and optionality (alternative) in BPMN represents events or gateways as inclusive, exclusive, event-based, or complex. If there is a *ϕ-task* in the outgoing path, then the following paths are optional. On the other hand if there is no *ϕ-task* in the outgoing path, then the following paths are most probably alternatives.

XOR – an exclusive gateway

In this case only one task of the following can be taken. If in the outgoing path a *ϕ-task* is included, all others after that are optional.

$A \vee \phi = P(A) \quad => \quad A \vee B \vee \phi = P(A) \vee P(B)$

The main semantics of the optional task is that if such a token is present in a task, it may be either executed, or not.

Alternative Expression

$$X(A_1, A_2) = (O(A_1) \vee O(A_2)) \wedge \neg(P(A_1) \wedge P(A_2))$$

[24]

OR – an inclusive gateway

If there is an inclusive gateway, then one of the outgoing paths is chosen.

In this case at least one task can be taken but is not obligatory. In the workflow, this can be expressed as follows:

A OR B is $(A \vee B) \vee (A \wedge B)$

If a *Phi ϕ* path is one of the other outgoing paths, then the structure is A OR B OR ϕ, which is represented in the following way:

$$\Phi \vee A \vee B \vee (A \wedge B) \vee (A \wedge \phi) \vee (B \wedge \phi) \vee (A \wedge B \wedge \phi)$$

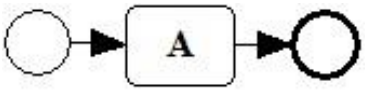
$$\Phi \vee A \vee B \vee (A \wedge B)$$

$$P(A \vee B \vee (A \wedge B))$$

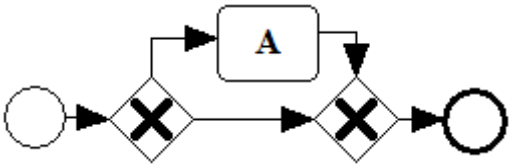
$$P(A \vee B)$$

We have $P(A \vee B) \equiv P(A) \vee P(B)$, which is actually an inclusive gateway.

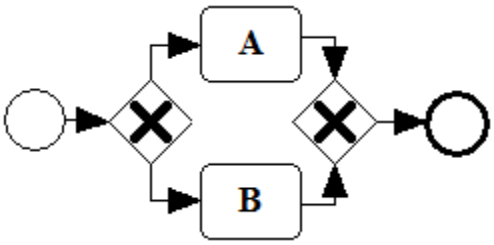
- Obligation O(A):



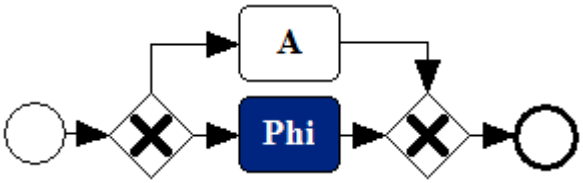
- Permission P(A):



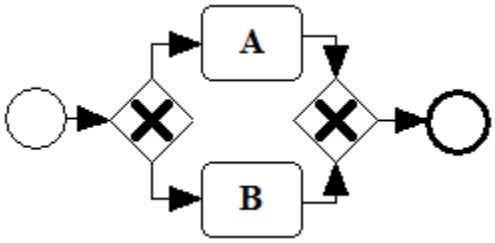
- Alternative: X(A) ∨ X(B):



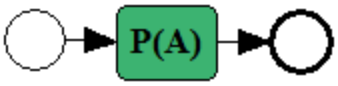
- Empty Task (ϕ –Task):



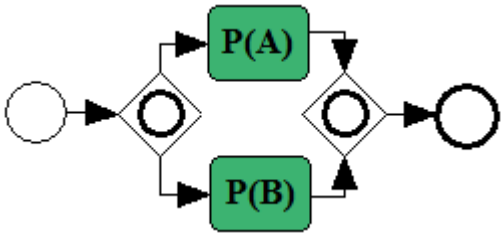
- Alternative Tasks:



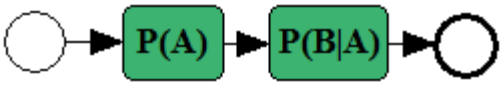
- Optional Task:



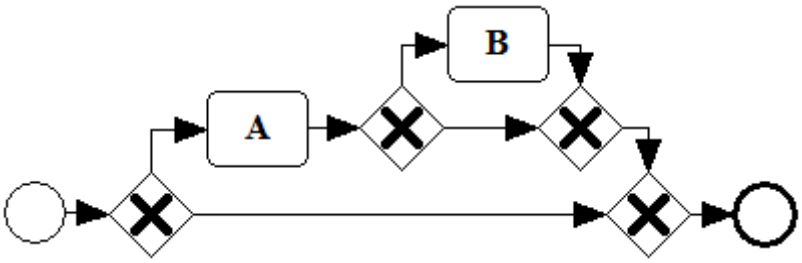
- Inclusive Gateway OR:



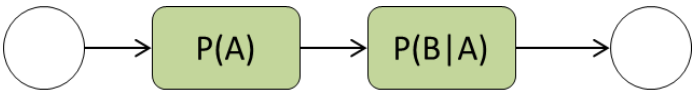
- Optional with Requires:



- Nested Exclusive Gateways:



BPMN model [23]

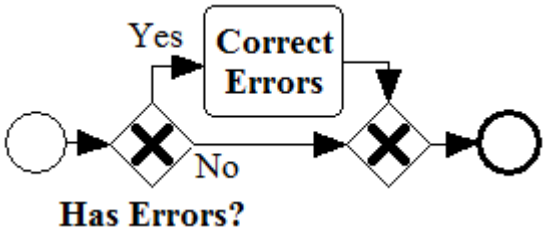


Deontic BPMN [23]

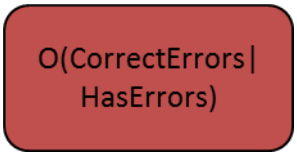
In the figure *BPMN model*, the process is expressed as a BPMN model, while in the next one a Deontic BPMN model is used. In the second case there is permission of *B*, but only if *A* is also executed. Task *A* is a precondition.

[22],[23],[25]

- Gateway with Decision:



BPMN model [23]



Deontic BPMN [23]

It is necessary to use preconditions in cases where there is no possibility to choose an outgoing path. This is the case if there is Event-Based Gateway where different events are included. An example of this is when the decision path reaches the 'Has Errors' point. There are two options following this point– 'Yes' and 'No'. If the decision is 'Yes', then the errors should be corrected. If not, then it is not necessary to do anything (ϕ – Task). In our case the task 'Correct Errors' is obligatory if errors exist, and the same forbidden if no errors occur. Furthermore, a forbidden task can be also omitted.

[22],[23]

Path examination

The structure of the path of the BPMN diagram can be complex. In a path examination all paths are introduced by a tree structure, including only the main splits of it. Using deontic logic, the different paths are afterwards compared and the activities specified in all paths that are obligatory. If an activity is found not in all paths but in some of them, then this activity

could be alternative or optional. If that is a ϕ – task, the activity will be alternative, otherwise it will be optional.

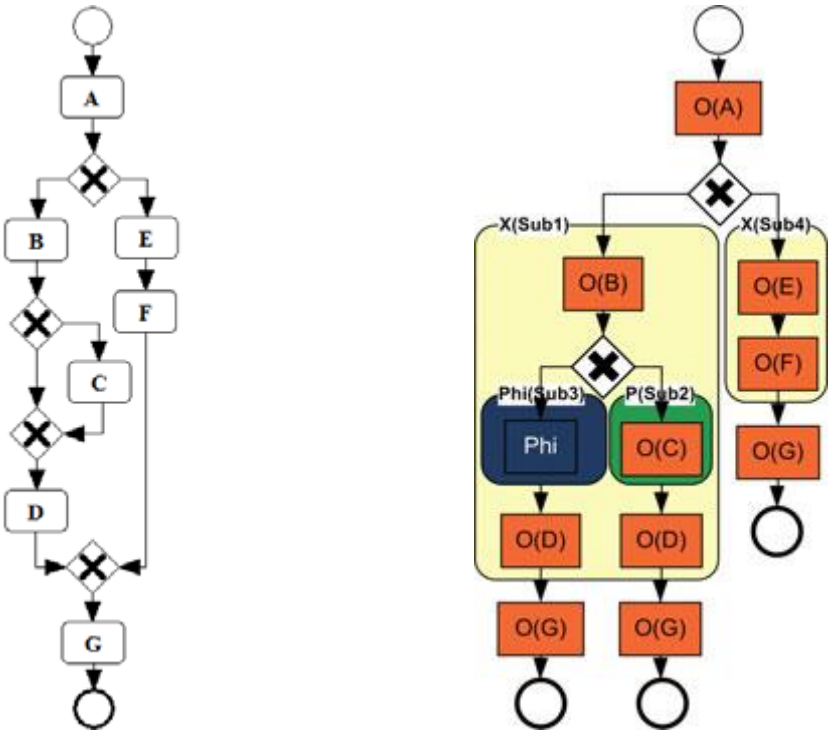


Figure 25: Acyclic diagram [24]

In *Figure 25* a simple example is presented of the acyclic diagram, with an explanation path adapted to the deontic logic. If there is a split in the outgoing processes, a new sub-process is established. If a task like task G in *Figure 25* is part of every sub-process, then this split ends. Parallel workflows do not bring any constraints as all tasks are obligatory in terms of deontic logic. Inclusive workflows include all combinations of different paths and are more complex. One virtual *Start Task* is represented with a split to all original *Start Tasks*. BPMN also gives the possibility for more than one *End Tasks*.

Another example of the transformation process from BPMN to Deontic BPMN is shown in *Figure 26*. Every single rule has the same number sequence flows or/and gateways, or less, and this leads to an easily understandable structure.

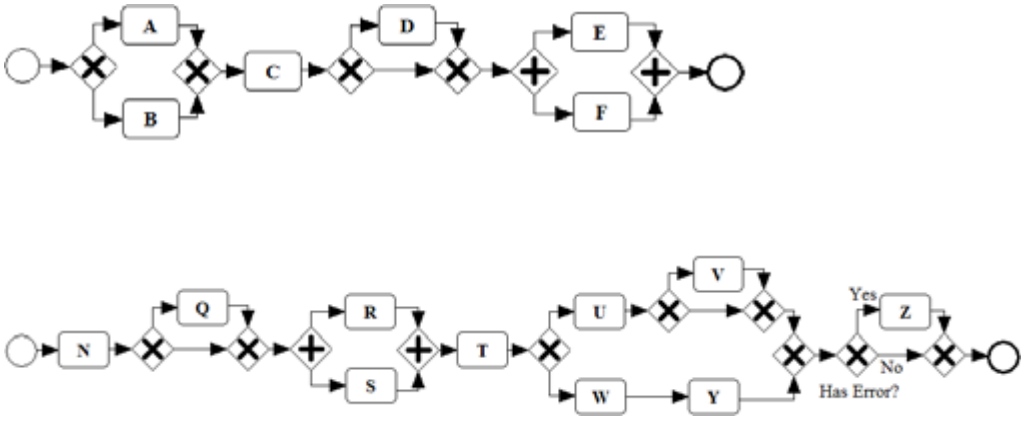


Figure 26: Example of transformation process [24]

4. Semantics of Deontic BPMN and BPMN

Deontic BPMN helps the user understand the design of a business process, while keeping the BPMN capacities. Both the Deontic BPMN and the standard BPMN serve different levels of observation abstraction. In BPMN, models have to be executed by different business process machines. For this purpose, all processes are described in detail. The Deontic BPMN describes the models from the viewpoint of a human user, capable of taking decisions, and gives the user the opportunity to make a choice. All choices are expressed as *P (tasks)* – Permission. The difference between standard BPMN and deontic BPMN is that in the first case all tasks are mandatory and choice is not available to the user. In the second case this is expressed by Obligation and *O (tasks)*. In order to have the same diagram, all tasks transformed from standard BPMN to deontic BPMN must be made compatible. All tasks in the deontic BPMN model have to follow the same sequence as in the standard one.

It could be the case that data or resources are not available and therefore a task has to wait for execution. In this case resources can be released, or new tokens introduced. For such cases, there should also be the option of not performing the task. This case is expressed by (O) Task – obligation. The user has the possibility to decide if this task is to be performed or is not. If the user decides not to perform it, the task should go further to other tokens and activities, or to another gateway.

The gateways' semantic in both business process notation models is the same. There are merging and splitting gateways. Every gateway can be either splitting or merging, or both. The difference between exclusive, parallel, and inclusive gateways is only in their outgoing flow overtaking tokens. [14], [24]

Standard BPMN tasks semantics

- If there is a choice requirement, then the task is true.
- The outgoing flow is always one, as well as the incoming one.
- If a task is already fired, a token is in the outgoing flow.

Deontic BPMN tasks semantics

There are five types of different tasks:

- Permissible – tasks with user-choice semantics.
- Optional (alternative) – tasks like the 'obligatory with precondition' *NotAnAlternative* task.
- Obligatory – tasks pass through a token only when they are executed.
- Obligatory with precondition *previous task* – if the previous task is obligatorily performed, then this one will be also performed when the token reaches it.
- Obligatory with precondition *NotAnAlternative task* – these tasks are used in exclusive gateways.
- Obligatory with precondition *user-choice* task – these tasks are used when there is a splitting of inclusive or exclusive gateway.

One of the main approaches is to avoid the 'ought' operator as this one is ambiguous, and use obligation, permission, or alternative operators instead.

[20],[23]

CHAPTER 6: Regulatory Compliance Process expressed by Deontic BPMN

1. Concept of compliance assurance

Compliance regulations, standards and requirements are graphically represented by the Business Process Model Notation. For more assurance and achieving representativeness and

understandability, the Deontic Business Process Model Notation is used. With this model notation it is more likely that consultants, business analysts and process owners with no specific skills can understand and follow the tasks. Time pressure is reduced and all necessary information is included. Every single process is represented with all its steps, and every business goal with its expected outputs.

In *Figure 27*, the correspondence between business processes and business objectives is shown. The service-oriented architecture 'SOA' concept illustrates all business and IT processes, and their relation to the respective regulatory bodies and standards. The IT services support the business services, which in turn are responsible for performing specific business processes within the process flow. All services are monitored and controlled by the Enterprise Service Bus, which gives further assurance for effective compliance. [26],[27]

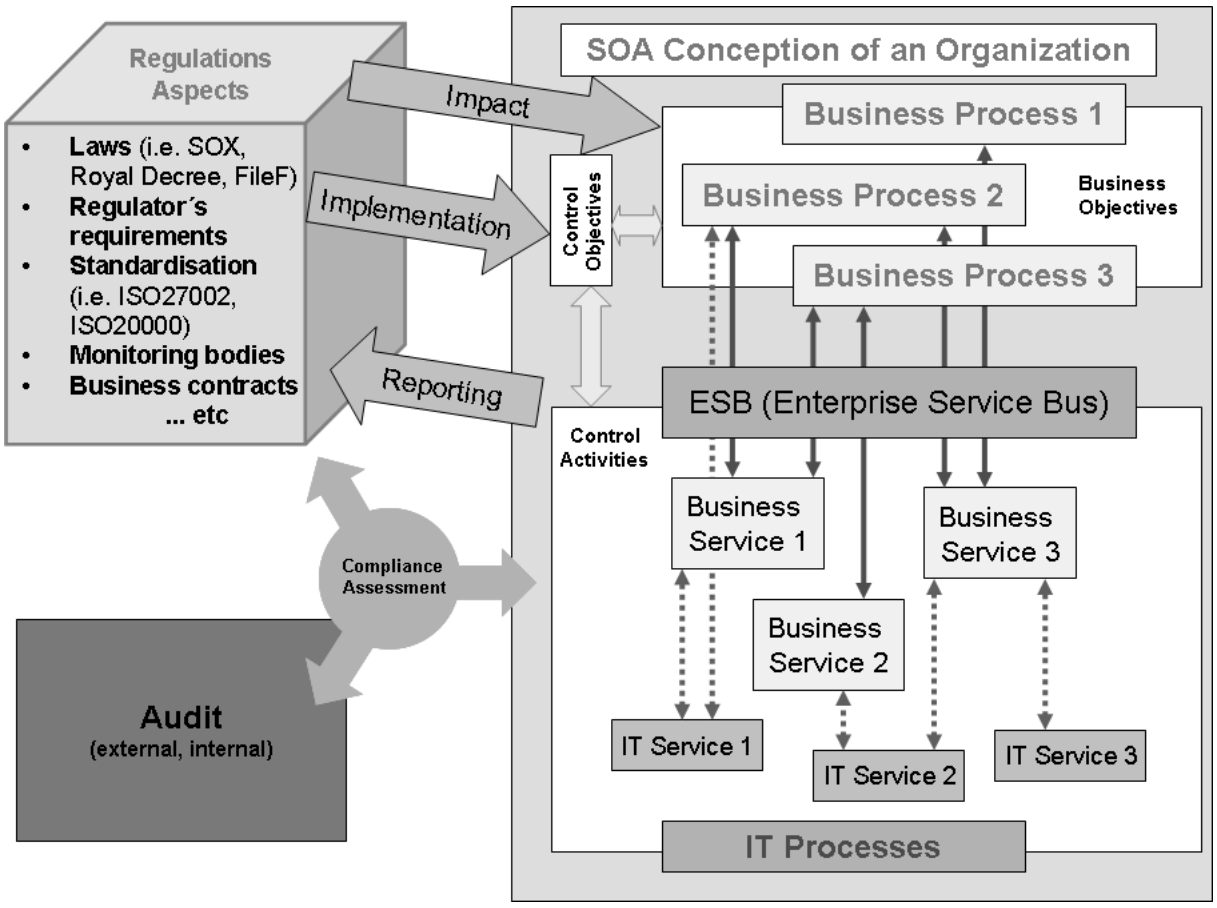


Figure 27: SOA Organization Concept [26, page 16]

2. Methods for achieving compliance

There are different tools and methods in existence for controlling the processes and giving compliance assurance. As already mentioned, the BPMN notation is a model notation that is most understandable for business analysts and consultants. To further enhance quality and express not only the process flow, but also the related activities, an extension is introduced – the Deontic BPMN. It gives better readability and reduces the time pressure and structure complexity.

To achieve compliance assurance, all business processes need to be analyzed and a methodology defined. There are several inputs to such an analysis, including:

- Process description and modelling in the deontic BPMN.
- Definition of KAI (Key Assurance Indicators) and KSI (Key Security Indicators). Both represent the outcomes of the process measuring and monitoring.
- Process design, aimed at realization of the relevant control targets.
- Description of the controls necessary for implementation.

The diagnostic part of the process infrastructure is performed by a Compliance Analyst. All tasks are then formulated and translated in the Deontic Logic BPMN notation based on the analysis. The model developed should be readable and easily understandable, including all steps and necessary information. All policies and steps should be harmonized, in line with the compliance infrastructure, and providing the necessary information.

[26],[27]

3. Regulatory Requirements in the compliance process

The main purpose of regulations is to control the behaviour of all subjects and to distinguish between legal and illegal situations. Usually regulations describe all conditions necessary for implementation and also the subsequent effect that is produced. All normative positions such as obligation, permission, or prohibition are regarded in compliance sense as regulatory effects.

The basic deontic effects with regard to compliance requirements are defined as:

Obligation: a situation, course or some kind of action to which the subject is legally bound and which is transformed in a violation if this one is not performed.

Prohibition: a situation or act which the subject should avoid and is transformed in a violation if this one is not performed

Permission: something is permitted (allowed) if there is no obligation or prohibition to the contrary in place.

Normative positions such as prohibition and obligation are restrictive conditions with regard to process actions. They are different from all other restrictions because the action can be stopped and this disruption will not stop the process itself. Such a disruption will not terminate the process, or make it impossible to execute the next token of the process flow. This means that there can be compensation and the process may go further. For example all contracts normally contain clauses that compensate other clauses. There are also disruptions that cannot be compensated and if such disruptions appear it means that the process is not compliant. Normative positions such as permissions cannot be violated, are and therefore do not play an active role in the compliance process. Permissions are only used to specify that no prohibitions or obligations to the contrary are in place. They can also be used to deflect other deontic effects. In the legal theory, there is powerful relationship between prohibition and obligation. As shown in *Table 3*, if A is prohibited that means that ¬A is obligatory, and also if A is obligatory that means that ¬A is forbidden.

Compliance identification can be used for recognizing violations of obligations in the process flow. There are several steps in doing that:

- Determine when, and at which step of the process the obligation occurs.
- What kind of consequences follow from the activities of the process?
- For how long does the obligation hold? Different obligations may hold for longer or shorter periods of time, and a specific norm may exist for the respective obligation. The obligation can hold until the norm is removed or terminated.

There are different kind of obligations in terms of compliance semantics and business process specifics:

- '*punctual obligations'* – referring to obligations that occur at a certain point in time;
- '*persistent obligations'* – referring to obligations that hold for an entire period, including all instances during that period;
- '*maintenance obligations'* – referring to obligations that need to be obeyed at all times during a period;
- '*achievement obligations'* – referring to obligations that need to be obeyed at least once in order to be fulfilled. If such an '*achievement obligation'* is allowed, then

we have the so-called '*preemptive obligation'*, in other case it is a '*non-preemptive obligation'*;

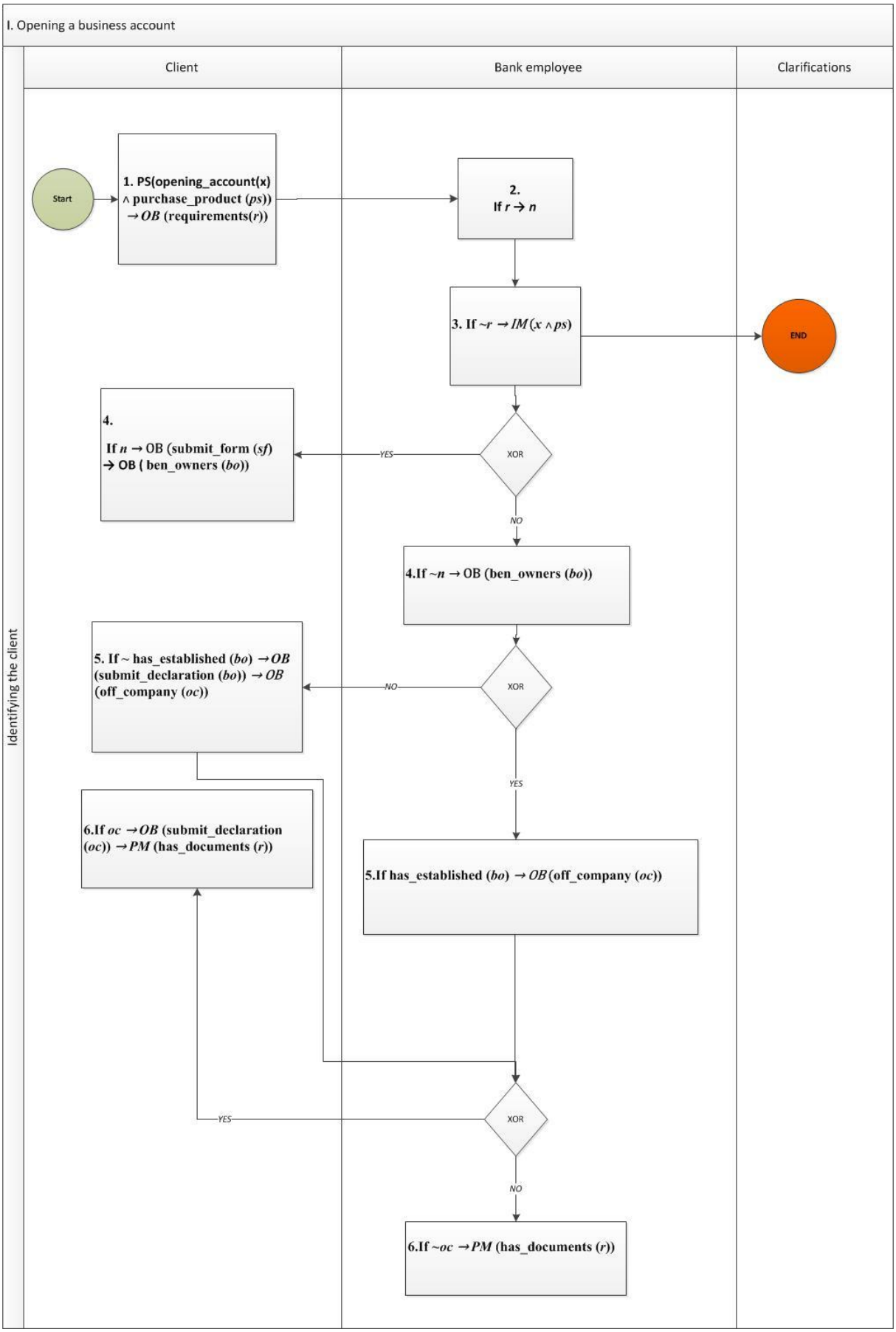
- '*perdurant obligation'* – referring to obligations that persist after they have been violated. If an obligation does not persist after it has been violated, it is called a ' *non-perdurant obligation'*.

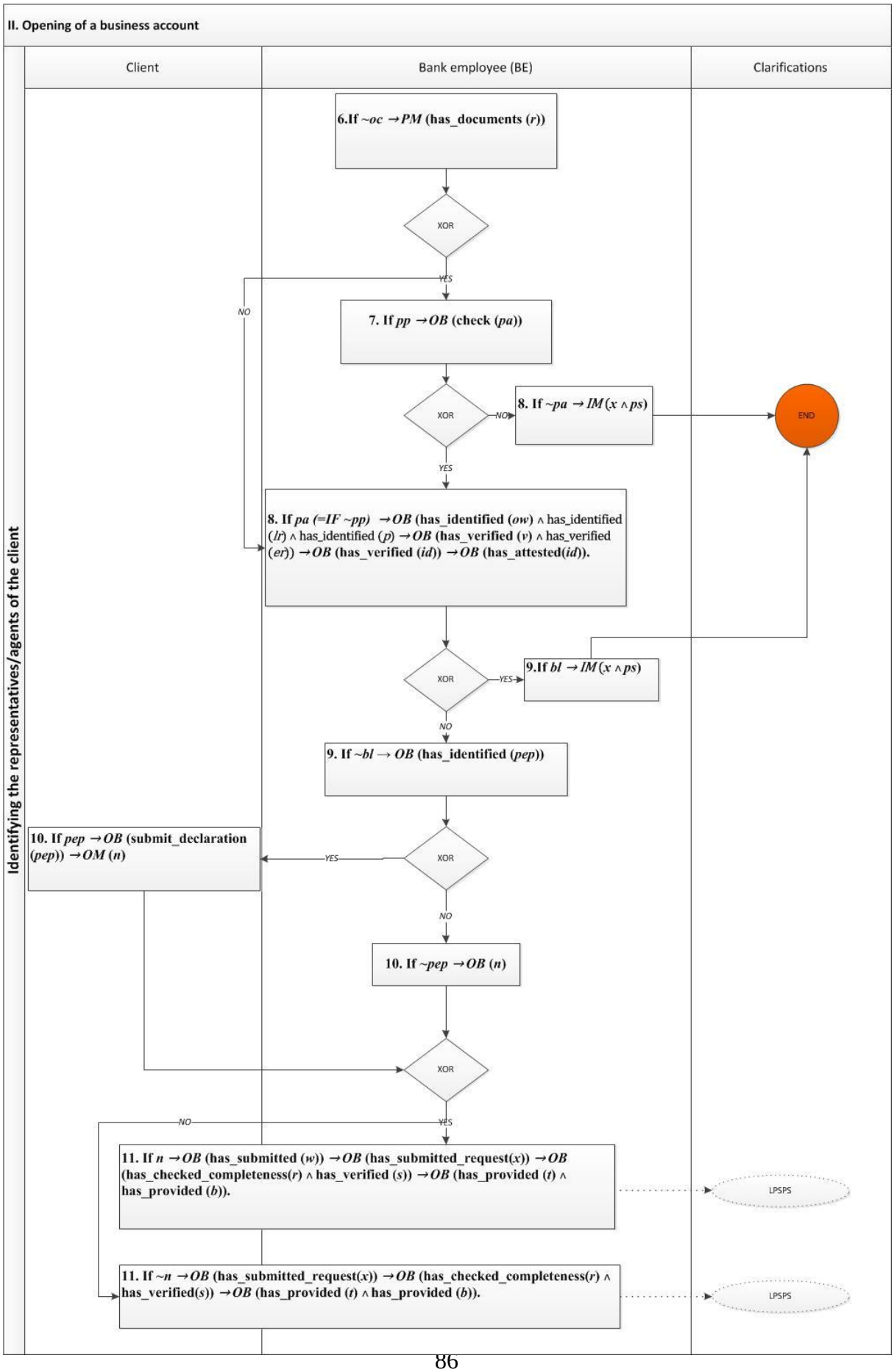
In systematic way it is obtained when consideration of obligations validation or prohibitions validation takes place. All effects and steps afterward are taking into account when violating them.

[15],[33]

4. Example 'Opening a business bank account'– DBPMN transformation

In Chapter 4, an example was given for opening a business bank account with the respective requirements. This example is now transformed (*Figure 28*) in Deontic BPMN. After specifying the rules for transformation, a graph is created showing the process workflow. When comparing both figures, the key DBPMN advantages are obvious: saving time, reducing the number of steps, clear and accurate token decisions. The readability of the notation does not require any additional knowledge from the compliance project managers. Decisions are taken without any constraints, while tokens are executed in the correct order following the logic of the process. The Deontic Model greatly reduces the complexity of certain process flow and also increases its readability by highlighting the permissible and obligatory activities. The different rules are defined in the deontic language, using the main deontic notions of *obligation*, *permission* and *prohibition*. All rules are expressed in DBPMN style, with regard to every step and requirement of the compliance process flow.


I. Opening a business account
Identifying the client
Client
Bank employee
Clarifications
Start
1. PS(opening_account(x) ∧ purchase_product (ps)) → OB (requirements(r))
2. If r → n
3. If ~r → IM (x ∧ ps)
END
4. If n → OB (submit_form (sf) → OB (ben_owners (bo))
YES
XOR
NO
4.If ~n → OB (ben_owners (bo))
5. If ~ has_established (bo) → OB (submit_declaration (bo)) → OB (off_company (oc))
NO
XOR
YES
6.If oc → OB (submit_declaration (oc)) → PM (has_documents (r))
5.If has_established (bo) → OB (off_company (oc))
YES
XOR
NO
6.If ~oc → PM (has_documents (r))


II. Opening of a business account
Identifying the representatives/agents of the client
Client
Bank employee (BE)
Clarifications
6.If ~oc →PM (has_documents (r))
XOR
YES
NO
7. If pp →OB (check (pa))
XOR
NO
8. If ~pa → IM (x ∧ ps)
END
YES
8. If pa (=IF ~pp) →OB (has_identified (ow) ∧ has_identified (lr) ∧ has_identified (p) →OB (has_verified (v) ∧ has_verified (er) →OB (has_verified (id)) →OB (has_attested(id)).
XOR
YES
9.If bl → IM (x ∧ ps)
NO
9. If ~bl → OB (has_identified (pep))
10. If pep →OB (submit_declaration (pep)) →OM (n)
YES
XOR
NO
10. If ~pep →OB (n)
XOR
NO
YES
11. If n →OB (has_submitted (w)) →OB (has_submitted_request(x)) →OB (has_checked_completeness(r) ∧ has_verified (s)) →OB (has_provided (t) ∧ has_provided (b)).
LPSPS
11. If ~n →OB (has_submitted_request(x)) →OB (has_checked_completeness(r) ∧ has_verified(s)) →OB (has_provided (t) ∧ has_provided (b)).
LPSPS

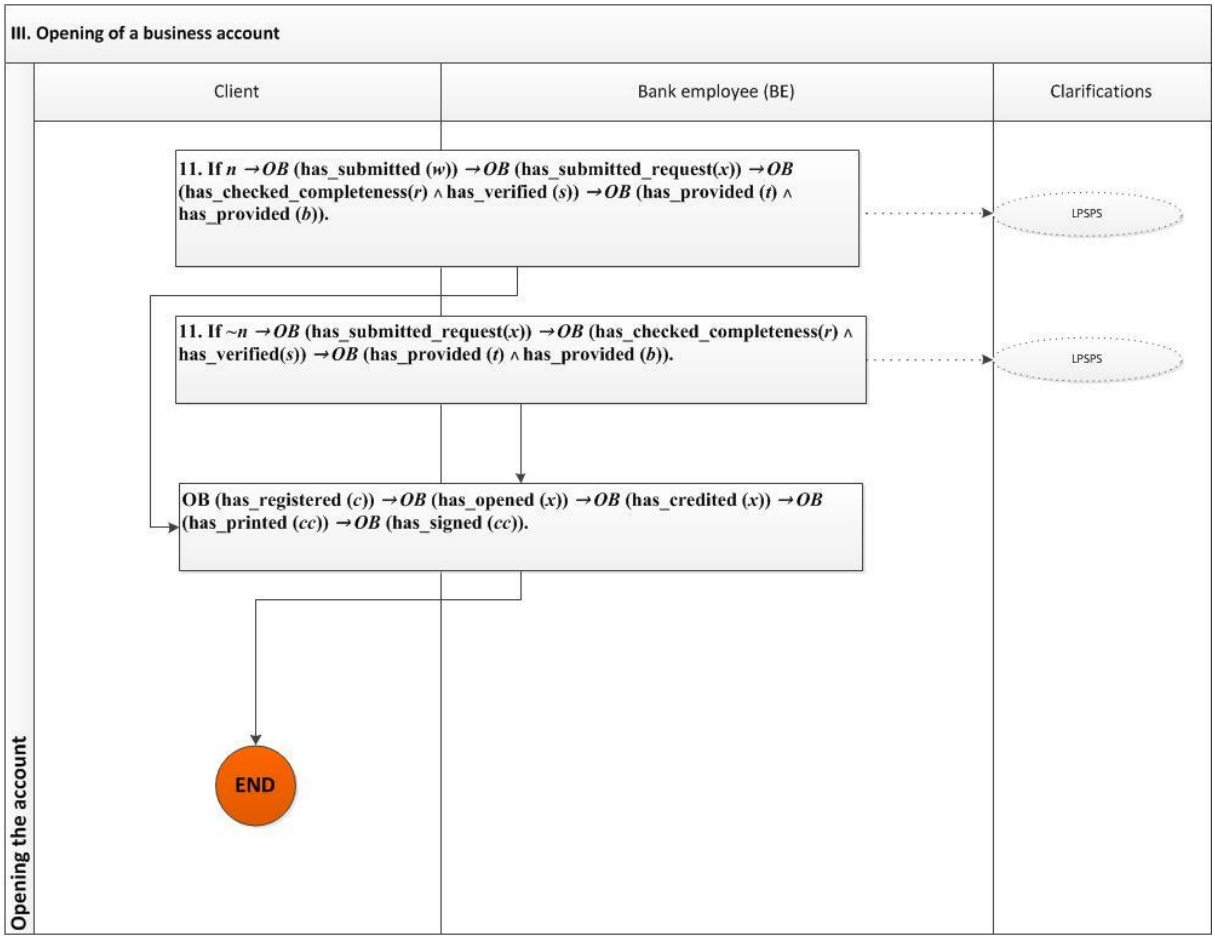


Figure 28: Transformation of Figure 19 [own source]

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CHAPTER 8: ABBREVIATIONS AND SYMBOLS USED

EU – "European Union"

ICAAP – Internal Capital Adequacy Assessment Process

FATCA – Foreign Account Tax Compliance Act (United States federal law)

NASDAQ – National Association of Securities Dealers Automated Quotation (an American stock exchange)

MiFID II – "Directive 2014/65/EU of "the European Parliament and of the Council" of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU"

OTC – Over-the-counter

OICV-IOSCO – Technical Committee of the International Organization of Securities Commissions

SEPA – Single Euro Payments Area

SIA - Securities Industry Association

USA – United States of America

BPMN – Business Process Model and Notation

DBPMN – Deontic Business Process Model and Notation

KAI – Key Assurance Indicator

KSI - Key Security Indicator

SDL – Standard Deontic Logic

DL – Deontic Logic

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