Models and Program System Development for Safety Exploitation in Maritime Transport

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Abstract – **Fast acceptance of principles of Quality Assurance in the transport industry is a base for developing of Intelligent Systems for Quality Assurance – IQMS (Intelligent Quality Management System) – as a tool for preventing of problems. The availability of such system (certified according to series of standards ISO 9000) is becoming more and more in a prerequisite for participation in international trade, including transportation process. Development of IQMS in maritime transport industry will give a possibility for preventive control and constantly improving of transport activity organization.**

Keywords – **IQSM, Database, Software**

I. INTRODUCTION

The technological progress in transport industry, in particular – maritime transport industry – do not follow automatically to the decreasing of fault and accidents level. The statistical data show that 80% of accidents in the shipping are caused by human factor. In the result, the society set requirements to the maritime industry for transparency and safety for humans, environment, and material resources. In shipping this bring to the acceptance of the chapter IX to the SOLAS convention (Ch.IX "Management for the Safe Operation of Ships), which is compulsory for ship owners, managers and their ships - International Safety Management (ISM) Code [1].

II. THE IQMS NEED IN MARITIME TRANSPORT

Many of accepted quality management conceptions have been used for safety management, in order to create a system for preventing accidents, collisions and environment pollution.

A Safety Management System in a Maritime Ttransport Oorganization, operating ships, should ensure:
- confidence to clients and the society that the safety and environment protection requirements are kept,
- systematical planning and performing of transport activities and services according to the documented rules,
- evidences (objective), that the relevant methods for the safety and environment protection requirements are applied,
- launching of effective corrective actions, to prevent appearances or reiteration of appeared problems,
- readiness to actions along the whole transport-logistic chain on raised accident situations, to restrain and minimize of accident consequences.

III. A MODEL

Rendering an account of the fact, that the requirements of ISM Code are in practice adaptation of the Standard ISO 9902 requirements in the shipping area [2], and they have more restricted range, it is recommended to create a united for safety and quality management system (SQMS), that suits the both standards requirements. The span, functional requirements and objectives of such system in the frame of transport logistic are shown in Fig.1,

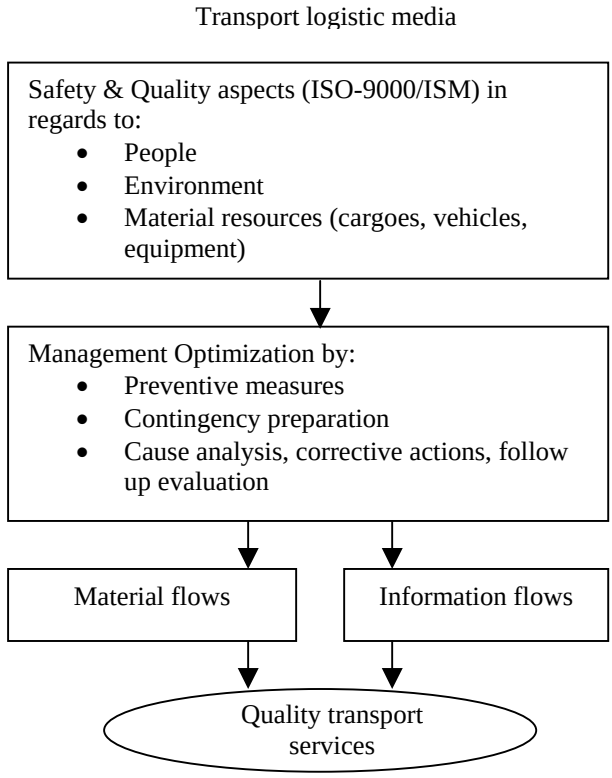

Fig. 1. IQMS for Maritime Transport

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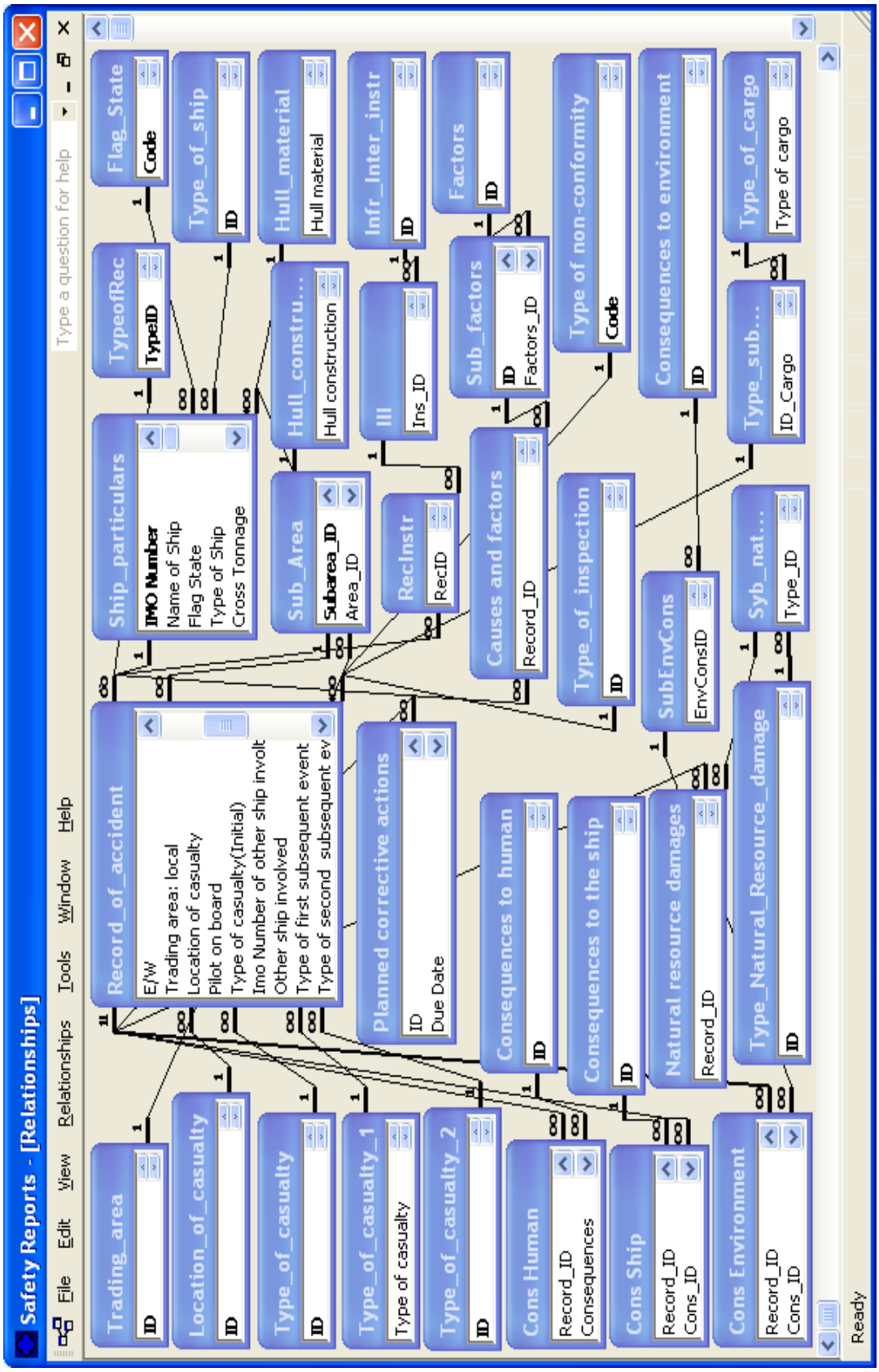

Fig. 2. Database prototype

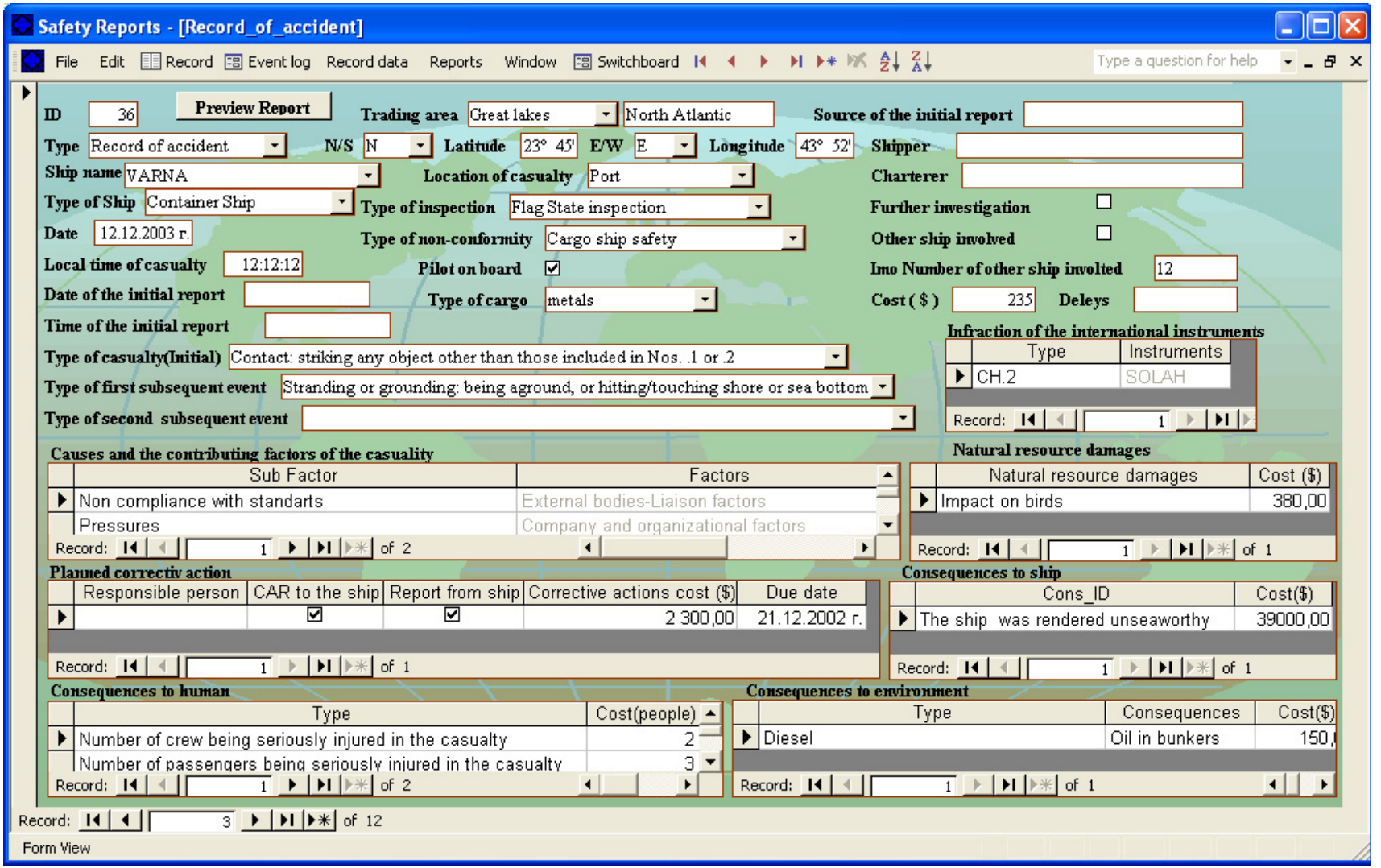

Fig. 3. Report subsystem

IV. Analysis & Prototyping

Document and data analysis include:
- ISO-9002 and ISM standards
- Quality control standard documents
- Available accident data from BMF - Varna
- Theoretic and software solutions [3]
- Possible software environments

Based on standards, the information about maritime events (accidents) include data objects:
- trading areas
- trading sub-areas
- types of ships
- types of cargo
- flag states
- hull construction
- hull material
- consequences to human
- consequences to ship
- consequences to environment
- natural resources damages
- types of natural resources damages
- causes and factors
- types of causes and factors
- types of records
- planned corrective actions
- types of casualty
- location of casualty
- type of inspection
- type of non-conformity
- ship particulars

A prototype of the system has been designed and realized, including:
- Database for storage of all standard documents and operative data: Areas, Ships, Types of Events (Accidents), Types of Records, Types of Reporting documents, etc.
- Report generating subsystem,
- Data analysis subsystem.

The database Safety Reports is a relational database, allowing to hold and manipulate all data, described above. Except the scheme (Fig.2) with tables and relationships, it include queries and end-user interface in form of menus, screen-forms and reports.

The Report generating subsystem (Fig.3) is a tool, allowing to search and display single or multiple accidents data based on single or multiple search arguments. In this version, it has being realized, using the MS Access functionality, called search by form. It allows to search data on:
- areas and sub-areas
- types of ships
- ship name
- types of accidents
- types of casualty (initial)
- types of first consequent event
- types of second consequent event
- consequences to human
- consequences to ship
- consequences to environment
- natural resources damages
- planned corrective actions
- pilot on board
- etc.

The data-analysis subsystem allows calculating and visualizing some statistical analysis on raw data, which is important for IQMS decision – makers – the maritime administration officers.

It offers:
- summarizing,
- averaging,
- finding trends
- finding max and min values

on most of available numeric data in the database.

It is possible to add extra functionality in form of Data Mining subsystem; which allows applying the more advanced mathematical methods for searching patterns and regularities in raw data.

The prototype database has been realized on Windows XP, MS Access XP environments in order to be used as local IQMS system. It is possible to migrate the system to advance distributed or Internet – accessible databases as Oracle, or MS SQL Server.

V. Conclusion

The developed IQMS system is a useful instrument in maritime management routine. It offers adequate support for most of data storage and data processing today needs in quality management in maritime transportation.

The system is functional and, according to the needs and resources of the end clients – Quality and Safety Control Sections in Maritime Transport, it is possible to migrate the system to more powerful environments, like MS SQL Server, Oracle.

Acknowledgement

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References

[1] International Safety Management Code

[2] ISO 9002 for Maritime Transport

[3] G. Kunev, V. Antonova, P. Vladimirova, System Modeling via Databases, ICEST2004, Bitola, Macedonia, 2004