BRITISH STANDARD

BS EN ISO 24978:2009

Intelligent transport systems — ITS Safety and emergency messages using any available wireless media — Data registry procedures (ISO 24978:2009)

ICS 03.220.01; 35.240.60

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The UK participation in its preparation was entrusted to Technical Committee EPL/278, Road transport informatics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2009

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ISBN 978 0 580 56103 0

Amendments/corrigenda issued since publication

Date	Comments

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 24978

October 2009

ICS 35.240.60; 03.220.01

English Version

Intelligent transport systems - ITS Safety and emergency messages using any available wireless media - Data registry procedures (ISO 24978:2009)

Systèmes intelligents de transport - Messages de sûreté et d'urgence pour les SIT utilisant tous les moyens de transmission sans fil disponibles - Procédures d'enregistrement des données (ISO 24978:2009)

Intelligente Verkehrssysteme - Automatischer Notruf zu Unfallmeldung (ISO 24978:2009)

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Foreword

This document (EN ISO 24978:2009) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 “Road transport and traffic telematics” the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.

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The text of ISO 24978:2009 has been approved by CEN as a EN ISO 24978:2009 without any modification.

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Foreword

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ISO 24978 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

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Introduction

The scale of death and injury on the roads of the world is recognized as a significant problem. To use a relatively safe continent, Europe, as an example, the European project Emerge calculated that in the EU, in 1998 (then including 15 countries), there were 43 000 dead and 1,7 million injured on the roads. By 2004, collated national statistics showed that the toll still exceeded 41 000 dead and 1,5 million injured. The death and injury toll in North America is at a similar level, and although, pro rata, the death and injury rates in Japan are at a slightly lower level, they remain unacceptable. Despite an aggressive road-safety policy, the statistics are slightly worse in Australia. In the emerging countries, the death and injury toll is significantly higher in almost every country.

As a result, in a series of initiatives around the world, governments have committed themselves to halving this carnage within a decade. In most of the developed world, where there have already been strenuous efforts to make the driving experience safer, it is becoming increasingly more difficult to make further improvements using traditional techniques. Intelligent transport systems (ITS) are therefore seen as being the key to achieving the ambitious targets that have been set.

Many ITS systems involve the exchange of data in order to provide services, and particularly safety services. Data is, and increasingly will be, sent from the infrastructure to the vehicle, from vehicle to infrastructure, from vehicle to vehicle, around the vehicle, and around the infrastructure. Much of this data remains within closed systems; however, an increasing amount of data can be shared to improve ITS service provision, and in particular, improve the safety of the driving experience and make a major contribution to the reduction of the death and injury toll. A number of intelligent transport systems/eSafety initiatives, such as "eCall" and "Automatic Crash Notification" crash messaging systems, are being developed. The European eCall project has an ambitious target to automatically provide, across the whole of Europe, a common 'minimum set of data' (MSD) to public service assistance providers (PSAPs) in the event of a crash.

Some of these data concepts, such as the MSD, are or will be defined and declared in International or Regional Standards, but much of the available and potentially useful data is not codified, and can be difficult to codify in standards because of differences between proprietary systems, and the speed at which the rapid evolution of systems provide data, which is much faster than the standardization process can agree and codify it.

Some of this data can be very useful to relevant third parties in crash, crash avoidance, crash mitigation and emergency systems. For example, a vehicle manufacturer can generate information about the number of persons in a vehicle, whether those persons are large or small (to ensure that airbags inflate safely), and they can monitor tyre pressure, speed of travel, etc. The available information can vary from vehicle model to vehicle model, can differ according to the manufacturer's market strategies, and will certainly differ and evolve over time so that the data available in a particular model in 2015 will be enhanced or different to that available in the same model in 2010. In these circumstances, it will be difficult or impossible to 'standardize' the available data as this would slow down the speed at which additional safety measures could be introduced, and interfere with the marketing incentives to provide additional safety services.

However, vehicle manufacturers might be able and willing to share that information with the emergency services, and might need an easy way to share information in collision avoidance and accident mitigation systems (such as ice and slippery-road alerts) and indeed might wish to collate data in order to more quickly identify and rectify design and software faults and reduce their exposure to liabilities. Road authorities might wish to make national data [such as variable message sign (VMS) information] available to vehicles in advance of international standardization of VMS messages or to deal with messages peculiar to that country.

While Europe can succeed in defining and codifying the common data concept known as the MSD, and can succeed in persuading vehicle manufacturers (by encouragement or legislation) to make this data available in the event of a crash or emergency, this will not pertain around the world. Other global initiatives, such as the 'Global Standards Cooperation' task force on automatic crash notification and emergency messages, can define additional or different data concepts. As described in the examples given in this introduction, vehicle manufacturers themselves will define data concepts that can be useful in the event of a crash or emergency, and to otherwise improve the safety of the driving experience.

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As technical capability improves and as more attention is given to safety-related services, it becomes imperative that transmitted messages can be quickly and clearly understood by the recipient, or by both parties in interactive safety systems.

There can be a wide variety of message recipients. In the case of emergency crash messages, this can be a public service answering point (PSAP) which can be highly automated, or it can be a simple human respondent whose requirement is to get some precise, and accurate, human readable data to support a telephone call to the emergency services. At the other end of the scale, in respect of automated collision-avoidance systems, and other automatic safety ITS services, this can be a vehicle-vehicle, infrastructure-vehicle, or vehicle-infrastructure communication. Throughout the whole range of such messages, it is crucial that safety-related messages be quickly, clearly and unambiguously understood by the recipient.

This requires that the definition of the data be not only precise, but also freely available, whether available to system designers at the point of system design/deployment, or immediately available to a PSAP or other relevant recipient in respect of situations such as emergency crash-notification systems. This requires the availability of a common data registry as a repository for these safety-related messages and data concepts.

This International Standard provides the framework for the standardized operation and quality of service for one or more freely available data registries for ITS safety messages and data concepts.

The definitions in this International Standard are consistent with ISO 14817 (ITS Data Registries) and ISO/IEC 11179 (General principles for data registries).

In respect of automatic safety systems, such messages are normally determined at the point of system specification. However, in practice, in-vehicle technology is already developing rapidly, and will continue to do so, and new and additional data can well become available during the life of a system. In case of emergency, vehicles will have available data on board that can be useful, indeed vital, to PSAPs. For liability reasons, now that vehicles are data rich, vehicle manufacturers can well equip vehicles with an "Event Data Recorder" (EVR), the equivalent of the aircraft "Black Box". Such a device can identify factors such as the speed of the vehicle immediately before the crash, acceleration/deceleration rates, whether anti-lock or traction control systems were activated, etc. Future vehicles can also carry data from collision-avoidance warnings and collision-avoidance technology: how many passengers, what gear the car was in, etc. Where these systems (or other useful and related information) are available, they can provide very useful and timely information to a relevant recipient such as a PSAP; it cannot, however, be "required" as part of a "Standard" message.

The resultant "ITS Emergency and Safety Data Registry/Registries" are therefore likely to contain a mix of standardized data concepts, proprietary data concepts, and data concepts designed for national or regional use.

Additionally, there is the important consideration that equipment introduced into vehicles in 2010 can still be operational in 2040, whereas wireless communications media have much shorter life expectations. So in addition to new and additional data concepts, the means of carrying these across wireless media will also change. This International Standard is therefore media independent. It does not specify any particular means of data transfer; it simply enables data that is transferred to be unambiguously understood by the recipient.

To improve the veracity of receipt of crash information, rather than relying on a single media, it is felt that, in many circumstances, such vital information is sent, where possible over multiple media, indeed using each and every available media.

It is also not the intention that there will necessarily be a single global ITS emergency and safety message data registry, although this can be desirable for specific reasons. Regional or national instantiations can also be supported by this International Standard.

This International Standard provides the framework in which to operate such a data registry. It does not mandate the use or provision of any data concepts, nor involve itself with the security of transmission, issues of privacy, nor technical means of data transfer. It simply provides the rules to operate, with a high quality of service, a data repository to enable relevant parties to immediately, usually by automatic means, understand the precise and unambiguous meaning of an emergency safety-related message.

It is recognized that, in most implementations, tools will be required to use the contents of the data registry. However, this International Standard defines only the procedures for such a registry and the definition of such tools is outside the scope of this International Standard.

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INTERNATIONAL STANDARD ISO 24978:2009(E)

Intelligent transport systems — ITS Safety and emergency messages using any available wireless media — Data registry procedures

1 Scope

This International Standard deals with intelligent transport systems.

This International Standard provides a standardized set of protocols, parameters, and a method of management of an updateable "Data Registry" to provide application layers for "ITS Safety messages" using any available wireless media.

2 Conformance

In order to claim conformance with this International Standard, wireless communication shall be established in full compliance with local telecommunication regulations, procedures and protocols for that media using the appropriate International or Regional Standards, and shall be able to demonstrate that they provide the mandatory data, and can provide any standardized optional data elements to the extent that such data is available, and there is an available medium to transmit the message.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

ISO/IEC 8824-1:2002, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8824-2:2002, *Information technology — Abstract Syntax Notation One (ASN.1): Information object specification — Part 2*

ISO 11179 (all parts), *Information technology — Metadata registries (MDR)*

ISO 14817:2002, *Transport information and control systems — Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries*

IEEE 1489:1999, *IEEE standard for data dictionaries for intelligent transportation systems*

4 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 14817 and ISO 11179 and the following apply.

4.1
automatic crash notification
automatic system to provide data notification to public-safety answering points, by means of any available wireless communications media, that a vehicle has crashed, and to provide coordinates and other relevant information in a message of standardized data concepts, not limited in length

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4.2
eCall
⟨generic⟩ system to provide notification and relevant coordinate information to public-safety answering points, by means of wireless communications, that there has been an incident that requires a response from the emergency services

4.3
eCall
⟨ITS Specific⟩ user instigated or automatic system to provide notification to public-safety answering points, by means of wireless communications, that a vehicle has crashed, and to provide coordinates and a defined minimum set of data

5 Abbreviated terms

5.1
CCC
change control committee

5.2
ETSI
European Telecommunications Standards Institute

5.3
EU
European Union (EU15 implies the 15 countries that formed the European Union prior to 2005)

5.4
GPS
global positioning system

5.5
ID
identity

5.6
ITS
intelligent transport system

5.7
m
mandatory

5.8
o
optional

5.9
OID
object identifier

5.10
PSAP
public service answering point

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6 Requirements for "ITS Safety Messages Data Registry" management

6.1 Concept of operation

This clause provides a summary overview of "ITS Safety messages" data dictionary and "Data Registry" operations. It identifies the parties involved in "ITS Safety messages" data dictionary and "Data Registry" operations, and specifies the responsibilities of each of the parties involved.

6.2 Summary

The "ITS Safety Messages Data Registry" shall support the harmonization of data concepts (e.g. data elements) from different stakeholder groups. It shall be consistent with ISO 14817 (Requirements for an ITS central "Data Registry" and ITS "Data Dictionaries"), and it and/or its entries are able to be submitted as (a) candidate(s) for an "ITS Data Registry" that is in accordance with ISO 14817.

The definition of key data elements may arise from numerous sources: PSAPs, automotive manufacturers, regulators, etc. Moreover, different groups will have an interest in the definition of the same data concept, which could lead to the prospect of duplicate or similar definitions being developed.

An ITS Safety or emergency data concept is data in a predefined and registered concept, recorded in such a manner that it is unambiguous and can be interpreted by reference to the data registry. The nature of form of the emergency or safety message is not defined by this International Standard, nor are the circumstances in which such a message is transmitted nor are the destination of the messages defined. This International Standard provides a specification of a process to register such data concepts in accordance with internationally recognized quality and implementation procedures as defined in International Standards, within the context of ITS. The procedures for submission and an acceptance process are defined herein.

A central "ITS Safety Messages Data Registry", or regional and national variants, of which the concept of operations are defined herein, supports standardization and harmonization processes that facilitate the different interested parties to share data element definitions and avoid duplication, yet enable the prompt admission of clearly defined and unambiguous entries from recognized sources, even where consensus and common data-concept definitions between interested parties have not yet been agreed upon.

The operational concept of the data registration is described in the following subclauses. See Annex C for specific procedural details.

NOTE There may be regional and national variations of this concept for operations.

6.3 Framework

The overall framework for the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries" is presented in Figure 1. It illustrates the relationships between

— the ITS safety services architectures (and information models),

— the "ITS Safety messages data dictionaries" (that are intended to include all data concepts),

— an "ITS Safety Messages Data Registry", and

— the ITS safety services applications.

For each of these physical elements, the diagram in Figure 1 also lists their key functions. For "Data Dictionaries", the "Data Registry" and the applications, it further identifies the key stakeholders or stakeholder groups that participate in or manage their operations. Finally, the diagram illustrates the information exchanged between these operational elements.

"ITS Safety messages data dictionaries" shall contain data concepts based on information flows documented in an "ITS Safety Messages Architecture". Each data concept in a data dictionary shall reference one or more

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flows of information between specific objects documented in a specific version of an "ITS Safety Messages Architecture", the primary architecture being as defined in this International Standard. Regional and National architectures are permissible.

The "ITS Safety Messages Data Registry" shall be the repository for submitted data concepts. Through the efforts of the data "Stewards", the "Registrar" and the data registry "Change Control Committee" (CCC) support identification of harmonization opportunities, recommendations for harmonization, and promotion of data concepts to higher quality levels where warranted. Finally, the "Data Registry" can provide data concepts to developers and other users for use in ITS applications.

Where considered appropriate by the sponsors, the day-to-day operational role of the CCC may be delegated to a single registry administrator in order to efficiently maintain the registry in a timely manner and to assist users in uploading and downloading data concepts.

Developers and other users should preferably use data concepts from the "Data Registry" at the highest (Preferred) quality level. The data concepts at this level are described unambiguously, harmonized across ITS sectors, and are considered representative of published data standards.

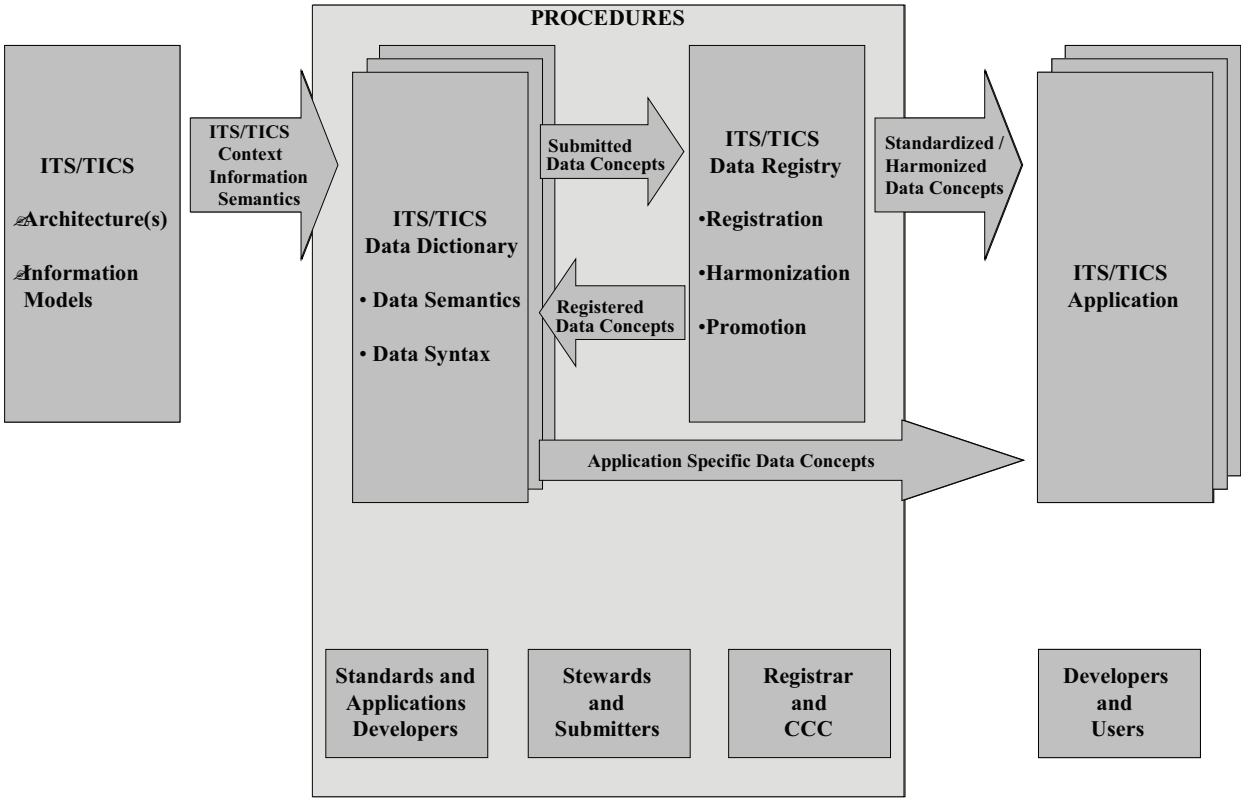

Figure 1 — "ITS Data Registry" operational framework

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Table 1 presents a summary of the distinguishing characteristics between a "Data Dictionary" and a "Data Registry".

Table 1 — "Data Dictionary"/"Data Registry" distinguishing characteristics

"ITS Safety messages data dictionary"	"ITS Safety Messages Data Registry"
Multiple "Data Dictionaries"	One (International) "Data Registry"
Covers single functional area	Covers multiple sources
Managed by a functional area steward	Managed by the CCC
Harmonized within the functional area	Harmonized across the ITS sector
Unique ID within functional area	Unique ID across the ITS sector

6.4 Organizational roles

6.4.1 Overview

Organizational roles associated with the ITS safety messages data registration process shall be established. The organizational roles shall include the "ITS safety Messages data registry" "Executive Board" (EB), the ITS safety messages Change Control Committee (CCC), the ITS safety messages "Registrar", ITS safety messages "Stewards" and ITS safety messages "Submitters". A summary of each role is provided in this subclause. Annex C provides a description of the purpose, specific responsibilities, and membership or selection criteria for each role.

Figure 1 provides a high-level view of how these organizational roles are related within the context of the "ITS Safety Messages Data Registry".

6.4.2 Registration authority

The "ITS Safety Messages Registration Authority" shall be in accordance with the ISO/IEC Directives, Part 1 (2008), H.4.

6.4.3 Registrar

The "Registrar" shall be an organizational element, expert in data registration processes, responsible for facilitating the registration of ITS safety messages data concepts and making those data concepts widely accessible and available to the ITS safety messages community. The "ITS Safety Messages Registration Authority" shall appoint the "ITS Safety Messages Registrar".

6.4.4 Steward

An "ITS Safety Messages Steward" shall be an organizational element of the ITS safety messages community, such as an ISO WG Convenor or his designated representative. "Stewards" are responsible for the accuracy, reliability, and currency of descriptive metadata for data concepts at a registration status level of "Qualified" or above within an assigned functional, regional or national area. "ITS Safety Messages Stewards" are approved by a process defined by the registration authority.

6.4.5 Submitter

An "ITS Safety Messages Submitter" shall be an organizational element recommended by an "ITS Safety Messages Steward" and approved by a process defined by the "ITS Safety Messages Registration Authority". A "Submitter" is authorized to identify and report data concepts suitable for registration. Such "ITS Safety Messages Submitters" may be organizations representing Regional or National Governments, organizations representing PSAPs, organizations representing automotive manufacturers, or automotive manufacturers directly. Publication of a "Card" level submission shall be at the discretion of the "ITS Safety Messages Steward".

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6.4.6 Read-only user

An "ITS Safety Messages Read-only User" shall be an organizational element or individual that is approved to review the contents of the "ITS Safety Messages Data Registry". A read-only user submits a request for access. Access is approved by the CCC or organizational element designated by the executive board. A read-only user has access to all the ITS Sector contents in the "ITS Safety Messages Data Registry", but is not permitted to submit, alter or delete the contents.

6.4.7 ITS safety messages change control committee

The "ITS Safety Messages Change Control Committee" (CCC) shall be the organizational element that is constituted to provide technical direction and harmonization of data contents for the "ITS Safety Messages Data Registry". The structure, staffing, procedures and membership of the CCC are determined by the ITS safety messages executive board. The membership of the CCC is to include the "ITS Safety Messages Stewards".

6.4.8 ITS safety messages executive board

The "ITS Safety Messages Executive Board" shall be an organizational element established by ISO/TC 204 and/or the sponsors of the data registry, or by the operators of an ITS safety messages data registry. In the case of an ISO/TC 204 official ITS safety messages data registry, it shall be responsible for administering responsibilities and authority delegated by ISO/TC 204. Responsibilities of the executive board shall include overall metadata registration policies and business direction of the "ITS Safety Messages Data Registry". In the case of an ISO/TC 204 official ITS safety messages data registry, the reporting responsibilities to ISO/TC 204 shall be specified and approval of executive board procedures and practices shall be subject to review and approval by ISO/TC 204 or its designated organizational component.

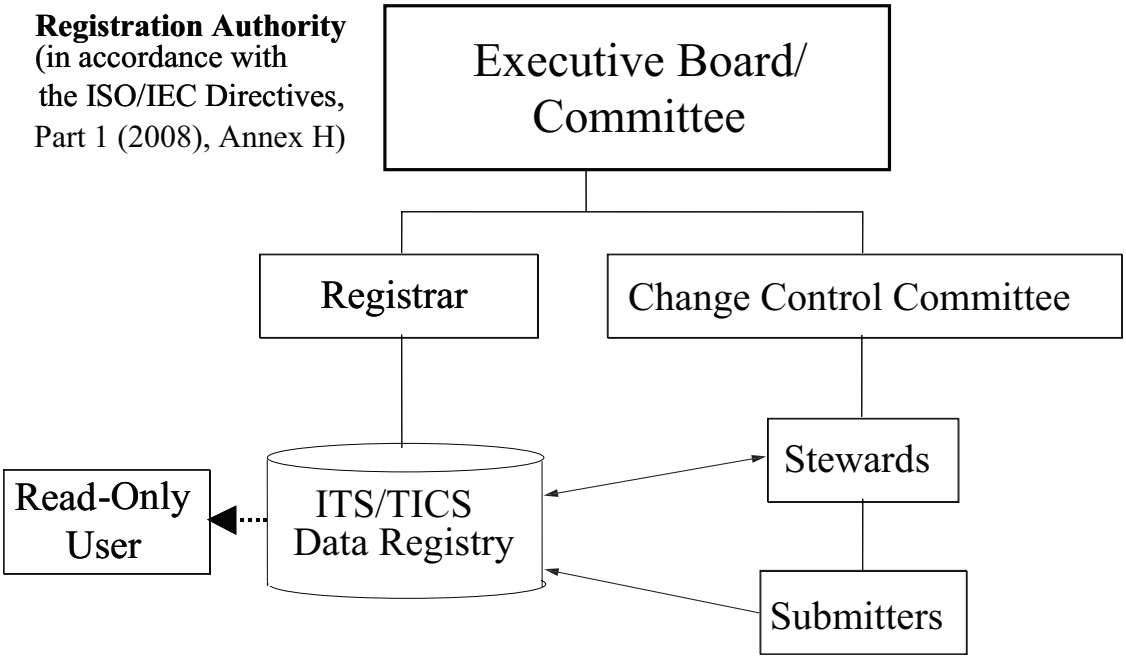

Figure 2 — Organizational roles to the "ITS Data Registries" and their relationships
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6.5 Registration status levels

6.5.1 Summary of registration status levels

Registration status levels shall apply to individual data concepts that have been entered into the "ITS Safety Messages Data Registry". There shall be five data-concept registration status levels:

- "Card"
- "Draft"
- "Recorded"
- "Qualified"
- "Preferred"

The relationships between these status levels, along with the requirements for a data concept to achieve a particular registration status level, are presented in Table 2.

Table 2 — ITS safety messages registration status levels and criteria

Data-concept status level	Status criteria
Preferred	"Change Control Committee" confirmation that a data concept is "Preferred" for use in the ITS safety messages community.
Qualified	"Change Control Committee" confirmation that all mandatory attributes are completed and conform to quality requirements.
Recorded	All mandatory meta-attributes for the data concept have been input.
Draft	At least the meta-attributes "Descriptive Name" and "Submitter Organization" have been completed.
Card	At least the meta-attributes "Descriptive Name", "Submitter Organization", "Submitter Phone Number" have been completed.

While the general intention is to progress as many data concepts as possible from "Draft" to the "Preferred" registration status, progression to a status higher than "Recorded" or "Qualified" may not always be appropriate. That is, necessary meta-attribute documentation for a data concept may not be available to establish required documentation for the "Recorded" status, may not be of the quality necessary for the "Qualified" status, or identification as the "Preferred" data concept may not be appropriate. Such data concepts shall be held at their current status level in the "ITS Safety Messages Data Registry" to facilitate understanding of and access to these data concepts by the ITS safety messages community.

6.5.2 Description of registration status levels

The status level of a data-concept entry shall be based upon the completeness of the data entered, its accuracy, and its conformance to the established format and syntax. The registration status levels shall be as listed below.

a) **Card** A data concept in the "Card" status shall indicate that the "Submitter" wishes to make the ITS safety messages community aware of the existence of a data concept in their local domain. A data concept in the status of "Card" in the "ITS Safety Messages Data Registry" shall be maintained under version control within the "Submitters" data dictionary. The "Submitter" may remove a data concept in the status of "Card" from the "ITS Safety Messages Data Registry" at any time. The minimum meta-attribute documentation for the "Card" status in the "ITS Safety Messages Data Registry" shall be: "Descriptive Name", "Submitter Organization Name", "Submitter Phone Number", and "Submitter Email Address".

b) **Draft** A data concept in the "Draft" status shall indicate that the "Submitter" wishes to propose it for progression up the "ITS Safety Messages Data Registry" registration levels. Data concepts in the "Draft" status are not maintained under version control, which means that updates will completely replace the

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original entry without retaining a record of the original. The "Submitter" may request the retirement of a data concept in the "Draft" status at any time, which will completely remove the data concept from the active "ITS Safety Messages Data Registry". The minimum meta-attribute documentation for the "Draft" status is "Descriptive Name" and "Submitter Organization Name".

c) **Recorded** A data concept in the "Recorded" status shall indicate that the "Submitter" has completed entries in all mandatory meta-attributes. A data concept in the "Recorded" status implies that the data concept may be shared across ITS domains. The contents of the mandatory meta-attributes may not conform to quality requirements. The "Submitter" may retire a data concept in the registration status of "Recorded" at any time. Data concepts in "Recorded" registration status, or higher, are maintained under version control.

d) **Qualified** A data concept in the "Qualified" status shall indicate that the CCC has confirmed that the mandatory meta-attributes are complete and conform to applicable quality requirements. In the event that a data concept is not approved by the CCC for the "Qualified" registration status level, it shall remain at the "Recorded" registration status level.

e) **Preferred** A data concept in the "Preferred" status indicates that the CCC confirms that the data concept is "Preferred" for use in the ITS safety messages community. The "Descriptive Name" and "ASN.1 Name" shall both conform to the ITS safety messages requirements.

6.6 Procedures

The "ITS Safety Messages Registration Authority" shall establish the necessary procedures to accomplish the following functional activities.

a) **Submission of data concepts for registration** "Submitters" shall submit data concepts for entry into the "ITS Safety Messages Data Registry". These data concepts may be "Recorded" as "Card" or "Draft" registration status, as the "Submitter" deems appropriate. A registration status of "Card" implies usage restricted to the "Submitter's" domain while being posted for informational purposes. The "Draft" status implies that the "Submitter" intends to progress the data concept to higher ITS safety messages registration status levels. "Submitters" or "Stewards" may progress data concepts in the "Draft" status to the "Recorded" registration status by completing all mandatory meta-attributes required for that data concept.

b) **Progression of data concepts** "Submitters" shall progress data concepts to "Recorded" status. Progression of data concepts to registration status of "Qualified" or higher shall require the sponsorship of a "Steward" and approval of the "Change Control Committee".

c) **Harmonization of data concepts** The objective of harmonization is to resolve any potential duplicate or overlapping of data concepts. Procedures shall be established to facilitate data-concept harmonization and reuse.

d) **Modification of data concepts** Procedures shall be established to change data concepts.

e) **Retirement of data concepts** Procedures shall be established to retire data concepts.

f) **Administrative processing** The "ITS Safety Messages Data Registrar" may assign administrative registration statuses in order to track an interim state of a data concept.

NOTE This subclause introduces the requirements for procedures associated with the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries". These procedures require organizational participation of certain roles, as specified in 6.3, in dealing with data concepts to be registered in the "ITS Safety Messages Data Registry", as identified in Clause 7. Annex C provides representative procedures to address these functional requirements. Annex E provides guidance on the documentation of data concepts in preparation for submission to the "ITS Safety Messages Data Registry" for registration.

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6.7 Version control

6.7.1 Version maintenance

This subclause presents the requirements for synchronization of the meta-attribute structures of the "ITS Safety messages data dictionaries" and "ITS Safety Messages Data Registry".

Configuration versions of the "ITS Safety Messages Data Registry" shall be maintained for meta-attributes.

A ‘Current Version’ and a ‘Development Version’ shall be established and maintained for attributes of the "ITS Safety Messages Data Registry". The versioning procedures in 6.7.2 and 6.7.3 shall apply.

6.7.2 Current version

The current version shall consist of those attributes approved by the CCC for current use in "ITS Safety messages data dictionaries" and the "ITS Safety Messages Data Registry".

6.7.3 Development version

The development version shall consist of those meta-attributes under development, together with pertinent current version meta-attributes, for use in "ITS Safety messages data dictionaries" and the "ITS Safety Messages Data Registry" as the next current version. The CCC controls the release of each development version as the new current version.

6.8 Summary of data concepts

NOTE The term 'data concept(s)' is used throughout the document to mean 'types of data concept(s)'.

This subclause defines and explains the nine data concepts applicable to this International Standard. These data concepts are consistent with ISO 14817. Data concepts refer to abstractions and things in the natural world that can be identified with explicit boundaries and meaning. The properties and behaviour of these fundamental constructs all follow the same set of rules. Within ITS, there may be data concepts to represent, for example, a Bus "Route" and relevant information about it. Specifically within ITS safety messages, they relate to information that may be of use to PSAPs in responding to an emergency situation which has been alerted via an ITS safety-messages message.

Data concepts include interface dialogue, message, data frame, object class, association, property, data element concept, value domain, and data element. See Figure 3 for an ASN.1 Information Object Specification (IOS) for an ITS safety messages data concept. Figure 3 presents a framework for data concepts and how they relate to one another. For illustration purposes, the braces, i.e. { and }, portray the particular relationships between the data concepts. The numeric annotation associated with each brace indicates the number of each data concept that may be realized. For example, there may be from 2 to n messages within an interface dialog, where n is any integer number. As another example, a message may consist of 0 to n data elements and 0 to n data frames.

Figure 4 presents interface data concepts and their relationships. Information interchange between two ITS safety messages system components shall be characterized from the top down as an interface dialogue or a set thereof. Interface dialogues shall be a set of messages whose order and timing for transmission is predicated upon a defined operational concept or scenario containing timing information. Messages shall be a collection of data elements and/or data frames which contain the substantial data to be exchanged.

Figure 5 presents model data concepts and their relationships. In support of the information interchange data concepts, additional data concepts for modelling are provided. These modelling concepts support the realization of the organization of the various data concepts by characterizing key relationships between the data concepts. See Annex E.

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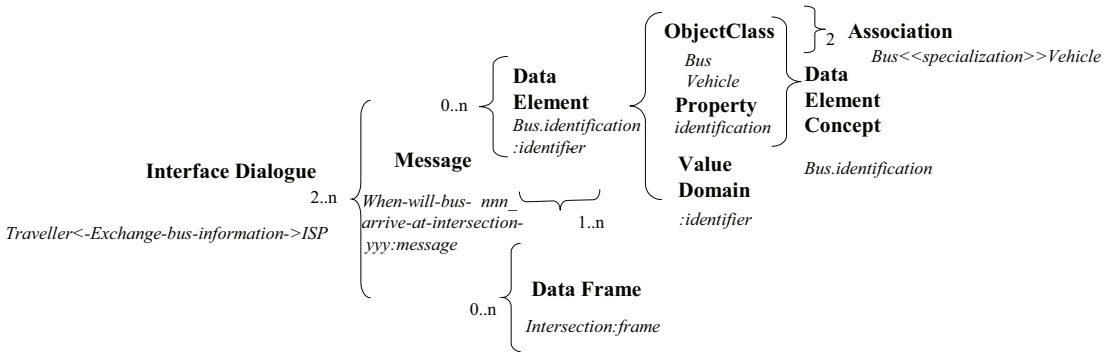

Figure 3 — ITS safety messages data concepts framework (ITS example from ISO 14817:2002)

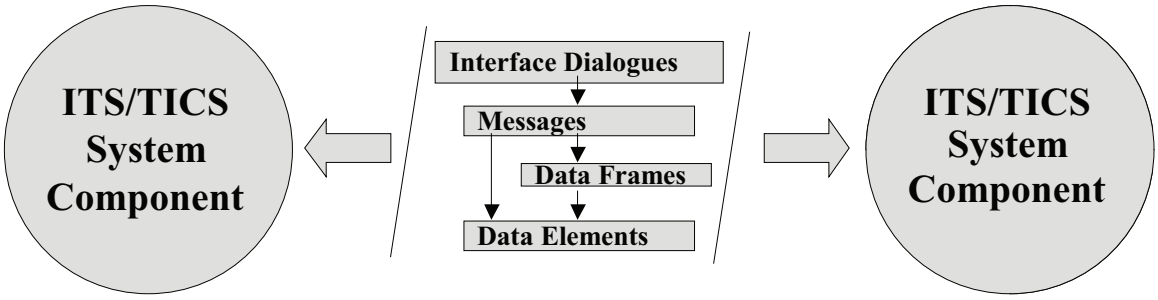

Figure 4 — ITS interface data concepts

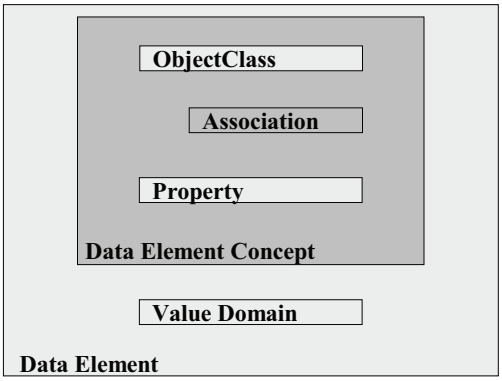

Figure 5 — ITS/ITS safety messages model data concepts

6.9 Interface dialogue

An interface dialogue shall be a temporal sequence of messages, including variants, among two or more system components that are used to accomplish a service/observable result. In Figure 3, the interface dialogue example is "Traveller<-Exchange-bus-information->ISP". A specific example of an ITS safety message might be, "Vehicle<-Exchange-location-information->ISP".

6.10 Message

A message shall be a structured grouping of data elements and/or data frames. In Figure 3 the message example is "When-will-bus-number-nnn-arrive-at-intersection-yyy:message." See Annex E for an example of "ASN.1 Information Object Specification" of a message.

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6.11 Data frame

A data frame shall be a structured grouping of data elements primarily for the purpose of referring to a group with a single name to efficiently reuse such groups of data elements that commonly appear together in a message specification. In Figure 3 the data frame example is "Intersection:frame." See Annex E for an example of "ASN.1 Information Object Specification" of a data frame.

6.12 Object class

An "Object Class" shall be a description of a set of objects that share the same properties, relationships and semantics within a given domain of discourse about which there is a need to represent some information. Modifiers that qualify or further specialize the object class may be used. An "Object Class" is one of three data concepts used to characterize a data element. In Figure 3, the object classes illustrated are "Bus" and "Vehicle".

6.13 Association

An "Association" shall be a structured relationship between two "Object Classes". A particular type of association is called a "Composition" in which an object of the “whole” class is in a “whole/part” relationship with objects of the “parts” class. Modifiers may be used to show a "Composition". In Figure 3, the association example is "Bus<<specialization>>Vehicle."

When an object class participates in an association, it has a specific role that it plays in that relationship. See Annex E for information modelling considerations.

6.14 Property

A "Property" shall indicate information of interest that applies to one or more "Object Classes". The information of interest might be a fact, proposition or observation about each object of the class. A "Property" is one of three data concepts used to characterize a data element. In Figure 3, the property example is "identification".

6.15 Data element concept

A "Data Element Concept" shall consist of an "Object Class" and a "Property". While in a form similar to a "Data Element", a "Data Element Concept" is devoid of a value domain or representation. In Figure 3, the "Data Element Concept" example is "Bus.identification".

6.16 Value domain

A "Value Domain" shall be a term that indicates, precisely and unambiguously, the format and syntactic form for "Data Concept" instance values. A "Value Domain" is one of three data concepts used to characterize a "Data Element". In Figure 3, the "Value Domain" example is ":identifier".

6.17 Data element

A "Data Element" shall be a formalized representation of some information (i.e. a property; e.g. a fact, proposition or an observation) about an "Object Class" (e.g. a person, place, process, concept, association, state, or event), with an explicit "Value Domain". A "Data Element" (a substantive instantiation of a data concept) shall be characterized by three data concepts (see Figure 3): object class, property, and an explicit value domain "Descriptive Name" (and value domain reference, where applicable, describing the physical form of the information). In Figure 3, the data element example is "Bus.identification:identifier". See Figure 4 for an example of "ASN.1 Information Object Specification" of a data element.

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7 Data-concept meta-attributes

7.1 Basic meta-attributes of data concepts

7.1.1 Meta-attribute categories

The basic meta-attribute categories of identification, definitional, relational and representational shall be used in the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries". The definition of each meta-attribute is provided in Annex D. See Annex E for meta-attribute applicability to various data concepts.

These basic meta-attributes may be represented in one or more (meta) data models to reflect more completely the relationships between the data. While selected meta-attributes are based upon ASN.1 syntax for data representation, alternative (meta) data models may result in alternative syntax. Consequently, additional meta-attributes to support other syntaxes (e.g. XML Schema, CORBA IDL, EDIFACT Graphical Syntax) may be added in future revisions and some existing mandatory attributes may become optional.

7.1.2 Identification meta-attributes

Identification meta-attributes shall differentiate one data concept from another. For example, the "Data Concept Identifier" together with "Data Concept Version" is a unique identification “tag” for a data concept within the ITS safety messages "Data Registry". The "ASN.1 Object Identifier" is also a unique identifier for each data concept. Other identification meta-attributes may be used, e.g. "Descriptive Name" and "Synonymous Descriptive Name", for identification purposes but may be less precise. See E.2.

The identification meta-attributes shall be as identified below.

— Data-concept identifier

— Data-concept version

— Descriptive name

— Synonymous descriptive names

— Symbolic names

— ASN.1 name

— ASN.1 object identifier

— Uniform resource locator

7.1.3 Definitional meta-attributes

Definitional meta-attributes shall describe the semantic aspects of a data concept. These meta-attributes may directly address semantic meanings (e.g. "Definition", "Remarks", "Abstract") or indirectly provide insights into the semantic aspects of a data concept (e.g. "Descriptive Name" context, "Source", "Data Concept Type"). See E.3.

The definitional meta-attributes shall be as identified below.

— Definition

— "Descriptive Name" context

— Symbolic name usage

— Source

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— Architecture reference

— Architecture name

— Architecture version

— Data-concept type

— Remarks

— Context

— Standard

— Metadata source

— Priority

— Frequency/message mode

— Delivery verification

— Data quality

7.1.4 Relational meta-attributes

Relational meta-attributes shall document associations among or between data concepts. See E.4.

The relational attributes shall be as identified below.

— Precursor

— Successor

— Synonym

— Abstract

— Roles

— Multiplicity

— Association constraints

— Aggregate

— Role key

— Referenced messages

— Referenced data frames

— Referenced data elements

— Referenced object classes

— Referenced associations

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7.1.5 Representational meta-attributes

"Representational Meta-Attributes" shall describe requirements for physical representation of "Data elements" and "Value Domains". These "Representational Meta-Attributes" shall define how "Data Elements" or "Value Domains" appear in databases or user interfaces, and constrain allowable processing activities. See E.5.

The representational meta-attributes shall be as identified below.

— Data type

— Format

— Unit of measure

— Valid value rule

7.2 Administrative meta-attributes

"Administrative Meta-Attributes" shall describe management and control aspects associated with a "Data Concept". For example, "Last Change User" identifies the user that last changed a data concept. "Registration Status" identifies the status level of a data concept.

The administrative meta-attributes identified below shall be used in the "ITS Safety Messages Data Registry" to facilitate administrative management of "ITS Safety Messages Data Concepts". These administrative meta-attributes are optional for the "ITS Safety messages data dictionaries". See E.6 for descriptions of these administrative meta-attributes.

— Registration status

— Date registered

— Last change date

— Last change user

— Registrar organization name

— Registrar phone number

— Steward organization name

— Steward phone number

— Submitter organization name

— Submitter phone number

— User

— View

— Related groups

— Security class

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8 Data-concept names

8.1 Descriptive names

Descriptive names shall be formulated when developing data concepts. Requirements for developing descriptive names for data concepts, their component parts and their abbreviations are described in Annex F. These requirements shall apply to the entire ITS safety messages data environment.

The "Descriptive Name" shall be a name that represents the meaning of a data concept. The "Descriptive Name" often serves as a synopsis of the data concept's definition. Abbreviated names are used primarily as physical names, and are also referred to as symbolic names, internal names, or access names in application database environments and application program interfaces or messages. When names are formulated by combining multiple terms that provide a more complete characterization of the data concept being named, then separators shall be used in various combinations to enhance readability. The use of these separators: period, colon, left caret, right caret and dash is defined in Annex F.

The "Descriptive Name" shall be unique.

8.2 Data-concept "Descriptive Name" formats

Descriptive names shall be constructed by combining the relevant component descriptive names with specific separators. The formats are shown in Table 3.

Table 3 — "Descriptive Name" formats for ITS safety messages data concepts

Data concept	"Descriptive Name" format
Object class	ObjectClassTerm
Property	propertyTerm
Value domain	value-domain-term
Data element concept	ObjectClassTerm.propertyTerm
Data element	ObjectClassTerm.propertyTerm:value-domain-term
Data frame	DataFrameTerm:frame
Message	MessageTerm:message
Interface dialog	SourceName<-InterfaceDialog->DestinationName
Association	RoleAObjectClassTerm <<associationtype>>RoleBObjectClassTerm

9 Meta-attribute requirements for ITS safety messages data concepts

The "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries" shall consist of meta-attributes for each data concept as delineated in Annex B. Annex C specifies the applicability of the meta-attribute to each data concept. Clause E.2 provides specific requirements for the "ITS Safety Messages Data Registry". Clause E.3 provides specific requirements for an ITS Safety messages data dictionary.

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10 International relationships

This International Standard recognizes that, while the ITS Sector is global in scope, national and regional "ITS Safety messages data dictionaries" and "ITS Safety Messages Data Registries" are developed according to individual national and/or regional requirements, as well as national and regional conditions. Indeed, because ITS safety-messages messages are safety related and potentially life saving, automotive manufacturers may choose to make their company-specific ITS safety-messages messages available well ahead of the consensus forming process.

11 Privacy

Privacy and data ownership and use rules, which are complex and vary by country, must be addressed before implementation of ITS safety messages.

Data concepts submitted to the data registry are, in their design, free of any specific values and therefore are free of personal data; for this reason, the data registry should be free of privacy issues. However, in the instantiation of eSafety data in operational systems using these data concepts, the assigned values may, in some cases, carry personal data. Local regulation will determine what data can be transmitted, what has to be encrypted and what privacy protection is provided.

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Annex A
(informative)

"ITS Safety Messages Data Registry", functional operating procedures

A.1 Introduction

This annex defines the overall concept of operations for the "ITS Safety Messages Data Registry". It identifies specific ITS safety messages roles and responsibilities and provides specific functional operating procedures for the use of the "Data Registry" (DR) and interactions with the ITS safety messages DR functional or national "Data Dictionaries". It also identifies roles and responsibilities associated with the "ITS Safety Messages Data Registry".

A.1.1 Registrar

The "Registrar" provides a single individual point-of-contact responsible for managing and maintaining information about ITS safety messages data in the "ITS Safety Messages Data Registry", under the authority of the "ITS Safety Messages Registration Authority". The "Registrar" is responsible for the following.

a) Monitoring and managing the "ITS Safety Messages Data Registry" contents.

NOTE The "ITS Safety Messages Data Registry" is established, operated, and maintained by the "ITS Safety Messages Registration Authority").

b) Enforcing policies, procedures, and formats for populating and using the "ITS Safety Messages Data Registry".

c) Proposing procedures and standard formats for the "ITS Safety Messages Data Registry" to the ITS safety messages DR CCC for consideration.

d) Recording current registration status for data concepts in the "ITS Safety Messages Data Registry".

e) Ensuring access for authorized users to contents in the "ITS Safety Messages Data Registry".

f) Assisting in the progression of data concepts through the registration status levels.

g) Assisting in the identification and resolution of duplicate or overlapping data concepts in the "ITS Safety Messages Data Registry".

h) Acting on direction from the "ITS Safety Messages Registration Authority".

i) Effecting registration of ITS safety messages data concepts in external data registries or data dictionaries.

j) Enforcing data registration procedures for submitting data concepts to the "ITS Safety Messages Data Registry", e.g.

   1) How to prepare, submit, and process submissions of data concepts.

   2) How the "ITS Safety Messages Data Registry" is used to avoid duplicate data-concept submissions to the "ITS Safety Messages Data Registry".

   3) How the "ITS Safety Messages Data Registry" is used to effect harmonization of data across "ITS Safety messages data dictionaries" of participating organizations.

   4) How external registries are used as a source of data concepts for reuse in the "ITS Safety Messages Data Registry".

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k) Maintaining a separate document recording the appropriate contact information for all members of the CCC and the executive board.

l) Adding new users or organizational entities that may become authorized to access the "ITS Safety Messages Data Registry".

m) Maintaining other controlled word lists of the "ITS Safety Messages Data Registry".

A.1.2 Stewards

"ITS Safety Messages Stewards" provide specific expert points of contact responsible for coordinating the identification, organization, and establishment of registered data for use throughout the ITS safety messages enterprise within an assigned area.

"ITS Safety Messages Stewards" are responsible for the following.

a) Co-ordinating the identification and documentation of data concepts within their assigned area.

b) Ensuring that appropriate data concepts in their assigned area are properly registered.

c) Co-ordinating with other "ITS Safety Messages Stewards" to attempt to prevent or resolve duplicated efforts in defining data concepts.

d) Reviewing all data concepts once they are in the "Recorded" status to identify and attempt to resolve conflicts among data concepts with other "ITS Safety Messages Stewards" responsible areas.

e) Ensuring the quality of meta-attributes for data concepts they propose for the "Qualified" registration status level, reusing standardized data from external data registries where applicable.

f) Proposing "Preferred" registration-status-level data concepts in their assigned area.

g) Ensuring that data registration procedures and formats are followed within their assigned functional area.

h) Recommending "Submitters" to the "ITS Safety Messages Registration Authority".

A.1.3 Submitters

"ITS Safety Messages Submitters" are organization elements that are familiar with or engaged in development and operational environments. "ITS Safety Messages Submitters" maintain current data concepts and are engaged to describe and submit new data concepts following the ITS safety messages data registration requirements.

An "ITS Safety Messages Submitter" is responsible for the following.

a) Identifying himself to the "ITS Safety Messages Registrar" in writing.

b) Identifying and documenting data concepts appropriate for registration in the "ITS Safety Messages Data Registry".

c) Submitting data concepts to the "ITS Safety Messages Data Registry".

d) Ensuring the completeness of mandatory meta-attributes for ITS safety messages data concepts proposed for the "Recorded" registration status level.

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A.1.4 Read-only users

A "Read-only User" is an organizational element approved by the "ITS Safety Messages Registrar" to review the contents of the "ITS Safety Messages Data Registry". "Read-only Users" may not add to, delete from, or otherwise modify the contents of the "ITS Safety Messages Data Registry".

A.1.5 Change control committee

The ITS safety messages DR CCC provides overall technical direction of, and resolution of, technical issues associated with the "ITS Safety Messages Data Registry", its contents and its technical operations.

The ITS safety messages DR CCC is responsible for the following:

a) Overall conduct of ITS safety messages registration operations.

b) Promoting the reuse and sharing of data in the "ITS Safety Messages Data Registry" within and across ITS safety messages functional-areas, and among external interested parties to the ITS safety messages enterprise.

c) Progressing data concepts through "ITS Safety Messages Data Registry" registration "Qualified" and "Preferred" status levels.

d) Identifying data concepts to be registered in external data registries or "Data Dictionaries".

e) Resolving technical issues associated with registered data concepts, e.g. overlap, duplication, etc.

f) Approving updates to data concepts previously placed in the "ITS Safety Messages Data Registry" in the "Qualified" or "Preferred" registration status levels.

g) Proposing "ITS Safety Messages Data Registry" policies to the executive board for approval.

h) Approving authorized "Submitters", "Read-only Users", and types of users, of the "ITS Safety Messages Data Registry".

i) Approving "ITS Safety Messages Data Registry" content, procedures and formats.

j) Submitting management-related recommendations and issues to the executive board.

k) Acting on directions from the executive board.

l) Meeting periodically in face-to-face meetings, with additional meetings and teleconferences held as needed.

The CCC shall normally fulfil its responsibilities via consensus building in accordance with an established procedure. Intransigent issues may be resolved by an established procedure.

A.1.6 "Executive Board" (EB)

The ITS safety messages executive board is responsible for overall policy and business direction for the "ITS Safety Messages Data Registry", to include the following.

a) Establishing overall "ITS Safety Messages Data Registry" policies.

b) Resolution of all business management issues pertaining to the "ITS Safety Messages Data Registry", e.g. copyrights, stewardship, funding, executive board membership, etc.

c) Ensuring the long-term success and performance of the "ITS Safety Messages Data Registry".

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d) Establishing and updating the "ITS Safety Messages Data Registry" charter and strategic plans.

e) Meeting at least semi-annually in face-to-face meetings, with additional meetings and/or teleconferences held as needed.

The executive board will normally fulfil its responsibilities via consensus building. Intransigent issues may be resolved by simple majority vote, one vote per member organization.

A.2 Registration concept of operations

A.2.1 Overview

The operational procedures for the "ITS Safety Messages Data Registry" are summarized in this subclause. These procedures describe registration and harmonization practices for the "ITS Safety Messages Data Registry". See Clause 9 for organizational roles and responsibilities (and their relationships), and for registration-status-levels definitions. This subclause describes the registration activities associated with "Submitters", "Stewards", and the "ITS Safety Messages Registrar" and CCC roles. Figure A.1 summarizes these functional activities.

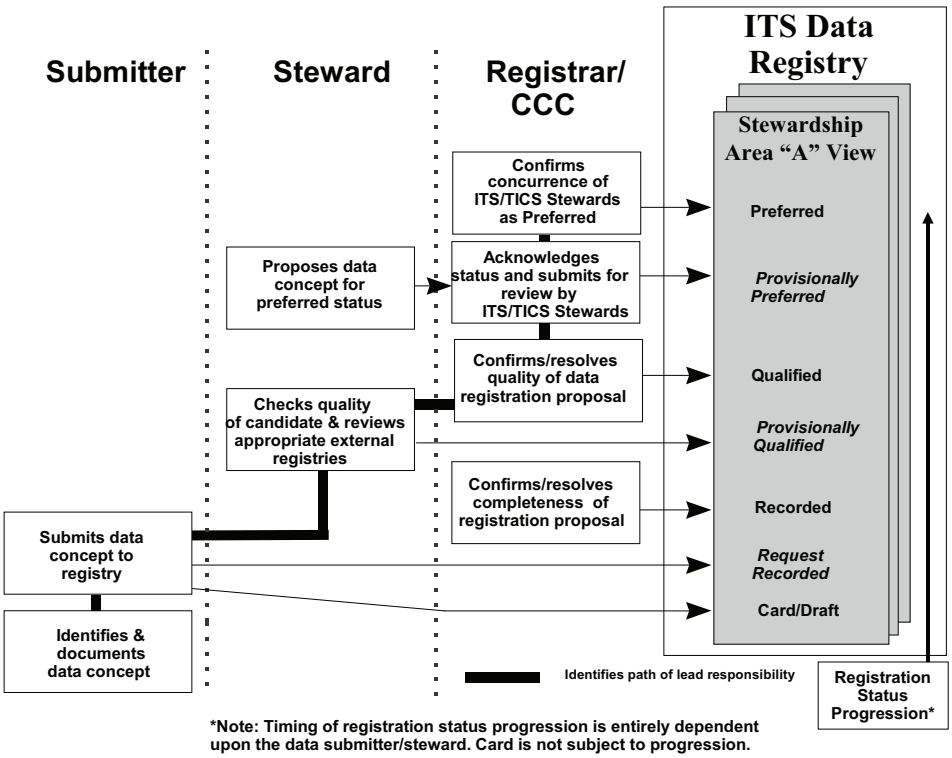

Figure A.1 — Registration functional activities for ITS data registries

A.2.2 Registration initiation

All "Submitters" accomplish the "Submitter" registration activities in the same way in accordance with these functional operation procedures so that data concepts are consistently and accurately registered. The responsibility of the "Submitter" is to propose and document data concepts for registration in the registration status of "Draft", and, if desired, propose data concepts for the registration status of "Recorded". A "Submitter" acquires an understanding of "ITS Safety Messages Data Concepts", their context and sources, and their significance in the course of accomplishing normal operational, design, development or management activities.

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A.2.3 Quality review

The responsibility of the "ITS Safety Messages Steward", for data concepts in an assigned functional area, is to ensure that quality registration candidates are passed to the "Registrar" for presentation to the CCC to be considered as "Qualified" data concepts. "ITS Safety Messages Stewards" may also recommend data concepts for "Preferred" registration status.

A.2.4 Registry administration

The responsibility of the "Registrar" is to co-ordinate the "ITS Safety Messages Data Registry" environment and manage the "ITS Safety Messages Data Registry", making its contents as widely accessible as feasible. Administrative levels are established to track the progression of a data concept in the transition from one status level to the next.

a) "Provisionally Qualified" — A data concept in the "Provisionally Qualified" status indicates that a "Steward" has confirmed that the mandatory meta-attributes are complete and conform to applicable meta-attribute quality requirements. The "Steward" is authorized to promote data concepts at the "Recorded" status to the administrative status of "Provisionally Qualified" at a time when the "Steward" believes that all quality requirements have been achieved. "Steward Organization Name" is mandatory and the "ASN.1 Name" ***shall be unique*** in the "ITS Safety Messages Data Registry" for data concepts at "Provisionally Qualified" or higher quality status.

b) "Provisionally Preferred" — A data concept in the "Provisionally Preferred" status indicates that a "Steward" proposes the data concept as "Preferred" for general use in the ITS safety messages community; however, certification of "Preferred" status of the data concept by the CCC is not yet complete. The "Steward" is authorized to promote data concepts from the "Qualified" level to the "Provisionally Preferred" at a time when the "Steward" believes the data concept to be a "Preferred" data concept.

c) "Retired" — A data concept in the "Retired" status indicates that the CCC has approved the data concept as no longer recommended for use in the ITS safety messages community. Data concepts in the "Retired" status also include data concepts in the "Recorded" status that the "Submitter" has retired. Such data concepts are retained in the "ITS Safety Messages Data Registry" archival storage facility for historic reference purposes. The "Retired" status identifies data concepts no longer considered appropriate for use in the ITS safety messages community. "Retired" data concepts are to include a reference (e.g. Successor meta-attribute) to replacement data concepts when appropriate. Edits of "Retired" data concepts are not permitted.

A.3 ITS safety messages data registration procedures

A.3.1 Overview

The ITS safety messages data registration procedures are described in the following subclauses. The step identifications are used in Figures A.2 and A.3 which are illustrations of this part of the procedure.

A.3.2 "Card" or "Draft" status data concepts

Step 1: "Submitter" identifies data concepts appropriate for these status levels in the course of normal activities. "Submitter" prepares a registration proposal documenting as many meta-attributes as possible described in this International Standard. "Submitter" validates the ASN.1 module definitions through the use of an ASN.1 syntax checker. "Submitter" initiates this status for data concepts they submit to the "ITS Safety Messages Data Registry". Unlike other ITS data registries, because of the safety implications, the "ITS Safety Messages Data Registry" requires a precise data definition at all levels, including "Card" status.

Step 2a: "Submitter" reviews data concepts to determine whether the data concept is to be progressed from a "Draft" registration status. If the data concept is not to be progressed, it is held in the "ITS Safety Messages Data Registry" in its current status level.

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Step 3a: "Steward" also reviews data concepts at least quarterly to determine, in co-ordination with an appropriate "Submitter", whether a data concept is to be progressed from a "Draft" registration status. If the data concept is not to be progressed, it is held in the "ITS Safety Messages Data Registry" in its current status level.

A.3.3 Recorded data concepts

Step 2b: "Submitter" determines that a data concept is to be progressed to "Recorded" registration status. The "Submitter" confirms that mandatory meta-attributes are complete, updating the meta-attributes as necessary (**Step 2c**). The "Submitter" then requests "Recorded" status for the data concept.

Step 3b: "Steward" determines that a data concept is to be progressed to "Recorded" registration status. For such data concepts, the "Steward" confirms that mandatory meta-attributes are complete, updating the meta-attributes as necessary (**Step 3c**). The "Steward" then requests "Recorded" status for the data concept.

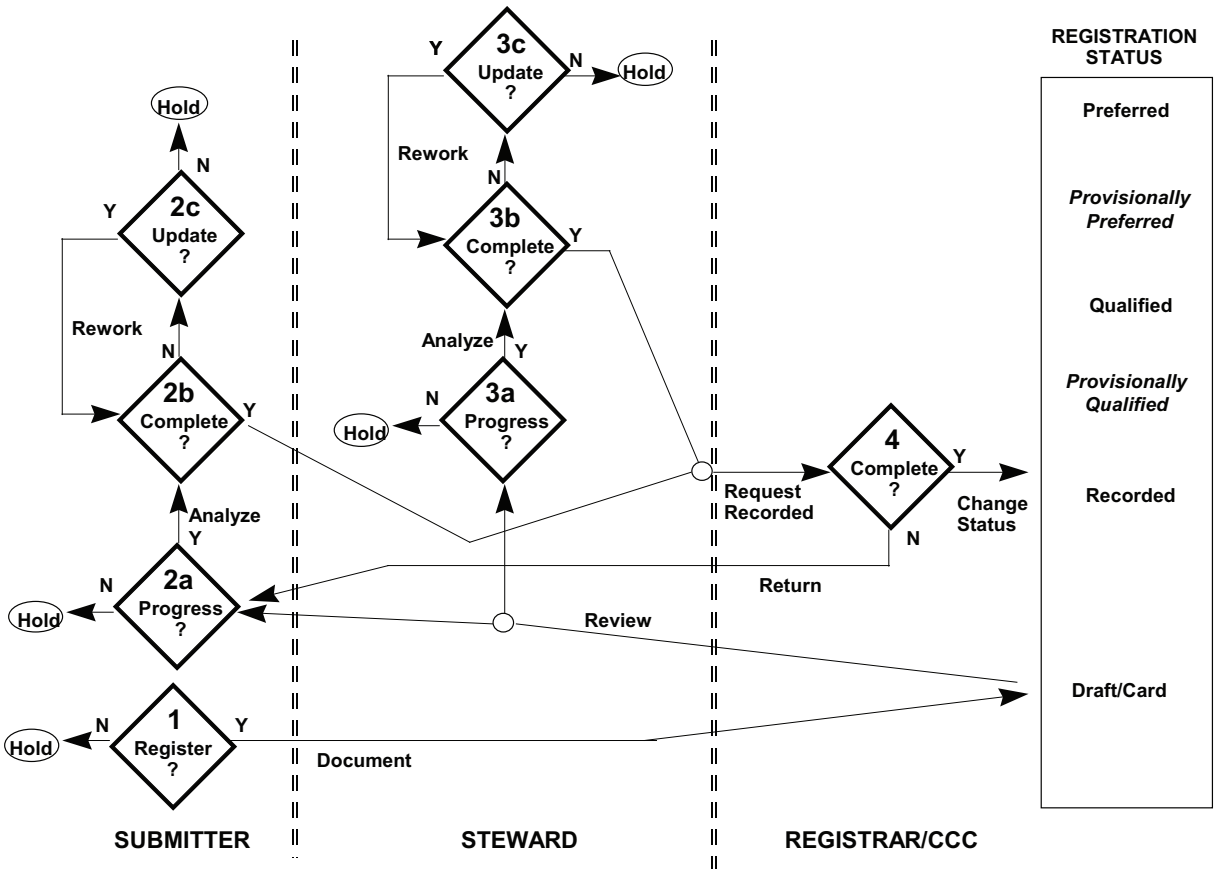

Figure A.2 — ITS safety messages data registration process flow, Part 1

NOTE 1 Where the diagram in Figure A.2 identifies a data concept going to a “hold” condition, this means that the data concept in question is held in its last approved registration status. “Hold” is not an additional registration status level.

NOTE 2 Placement of any data concept from any "Submitter" into the "ITS Safety Messages Data Registry" at "Card" or "Draft" registration status levels is entirely dependent upon the appropriate "Submitter"/"Steward" authority deciding to do so. Furthermore, progression from either of these registration status levels to any higher registration status level is also entirely dependent upon the interest of a "Submitter" or "Steward" to progress any such data concept. This means that it is up to the "Submitter" and/or "Steward" to propose promotion of data concepts when and if they choose to do so. In this International Standard, no time line is specified by which any registration status progression must happen.

NOTE 3 Any data concepts registered in the "ITS Safety Messages Data Registry" are presumed to be retained for informational purposes, regardless of whether they are ever proposed for progression so that the ITS safety messages community can be aware of data concepts for possible reuse.

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