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TECHNICAL REPORT

colour inside

Electronic displays for special applications – Part 1: General introduction

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Part 1: General introduction**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRONIC DISPLAYS FOR SPECIAL APPLICATIONS –

Part 1: General introduction

FOREWORD

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IEC TR 63340-1 has been prepared by IEC technical committee 110: Electronic displays. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
110/1709/DTR	110/1728/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63340 series, published under the general title *Electronic displays for special applications*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

This document intends to gather related information for future standardizations of various display applications, and to clarify the relationship to normative aspects of the standardization in these application fields. Because a Technical Report (TR) is entirely informative, this document does not intend to formulate strong strategies. This document provides possibilities and candidates of strategies to extract application fields for standardization. The relation and difference between application-based standardization and technology-based standardization are discussed in Clause 4. In the application-based standardization, how to adopt something to others is analyzed with clarifying "context of use" and "an optimum degree". Therefore, requirements, required threshold values, or specifications are important. In addition, by technology developments these requirements become advanced more, and Clause 5 explains how to update these requirements in standards. There are some applications for which technical committees (TCs) have already been established, and the collaboration modes with related TCs are explained in Clause 6. In Clause 7, five application candidates have been extracted using inventory tables, and the key criteria is the public and societal natures. Clause 8 explains possible strategies and schemes for application-based standardization. The necessities of each application standardization are described in other TRs.

ELECTRONIC DISPLAYS FOR SPECIAL APPLICATIONS –

Part 1: General introduction

1 Scope

This part of IEC 63340, which is a Technical Report, provides related information for future standardizations of various display applications. This document includes overview of display applications, and the possible strategies to standardize these application fields.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
standardization
activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context

Note 1 to entry: In particular, the activity consists of the processes of formulating, issuing and implementing standards.

Note 2 to entry: Important benefits of standardization are improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation.

[SOURCE: ISO/IEC GUIDE 2:2004, 1.1]

3.2 Abbreviated terms

HMI   human–machine interfaces

JWG   joint working group

PT   project team

SDG   Sustainable Development Goals

SDO   standards development organization

TC   technical committee

TR   technical report

WG   working group

4 Significance of application standardization

According to ISO/IEC GUIDE 2:2004 [1][1], 1.1, the term "standardization" is defined as "activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context". For this activity, it is necessary to clarify "a given context", "an optimum degree", "problems" and so on. In the field of display industry, these depend on how and where to use displays, and what to be shown on displays. It is significant to consider applications of displays.

Electronic displays have become essential components of human–machine interfaces (HMI) and consequently the production volumes of these displays have increased steadily to meet the increasing demand. Further growth is expected due to the expansion of application of displays, being pushed by smart house, smart office, connected industries, remote office, drone, security camera, and others. Automotive, gaming and e-sports applications, where the market is growing rapidly, demand a special requirement for it.

In addition, in the field of display applications, related users and industries exist, and the standardization activities need to hear their opinions. A key will be how to meet the expectations and demands of related industries, and how to contribute to them. Application standardization has an aspect of communications with related industries. Through these communications, it is essential to clarify specific points to be mainly contributed by display industry.

Regarding the contributions from display industry, because many related industries use electronic displays, the harmonization among the related industries is important. For example, if different industries adopt different test methods without any specific reasons, it will cause confusion. The specific points on how to contribute to their harmonization are described in Annex A.

In some specific application industries, such as medical equipment, if these industries need to standardize some requirements or threshold values in the relevant application TCs, the related TC of display industry would contribute to them. For example, the appropriateness of the threshold values can be commented on, and appropriate test methods to obtain the test results can be suggested.

NOTE 1 An example would be a standardization of medical image display systems in IEC/TC 62/SC 62B. Evaluation methods, acceptance and constancy tests, and performance criteria for diagnostic imaging equipment in medical practices are being standardized. This standardization aims at establishing the performance criteria for medical displays.

NOTE 2 How measurement and evaluation methods will be harmonized across different industries is described in Clause 8.

The definition of standardization (3.1) suggests an approach based on a set of rules ("context", "degree", "problems") that must be adhered to. On the other hand, a technology-based approach exists. When a new technology appears, the definition and measurement methods can be standardized, as shown in Figure 1.

Generally speaking, regarding the application-based approach, the adoption of something by users is analyzed. For this analysis, clarifying "context of use" and "optimum degree" is key. This means that requirements, required threshold values, or specifications are important. Generally, specifications include blank detail specifications which can be effective for stipulating specific measurement and test conditions to each application.

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[1] Numbers in square brackets refer to the Bibliography.

In order to obtain values, measurement and test methods can apply, but it can be noted that between the application-based standardization and the technology-based standardization, the start line of considering measurement and test methods would be different. Therefore, it is crucial that these are harmonized in the function-based standardization. In addition, in many cases, thanks to the technology developments, application demands and requirements become more advanced, which means that these are not static, but dynamic based on applications and technologies. How to update the requirements in standards is explained in Clause 5.

Regarding measurement and test methods, in the technology-based standardization, many possibilities or variations of methods can be considered and therefore meaningless developments of measurement and test methods are avoided. However, in application-based standardization, measurement and test methods are based on actual or potential problems of markets. Some methods in the technology-based standardization are not necessary in some applications. It is important to gather contexts of use and demands of each application.
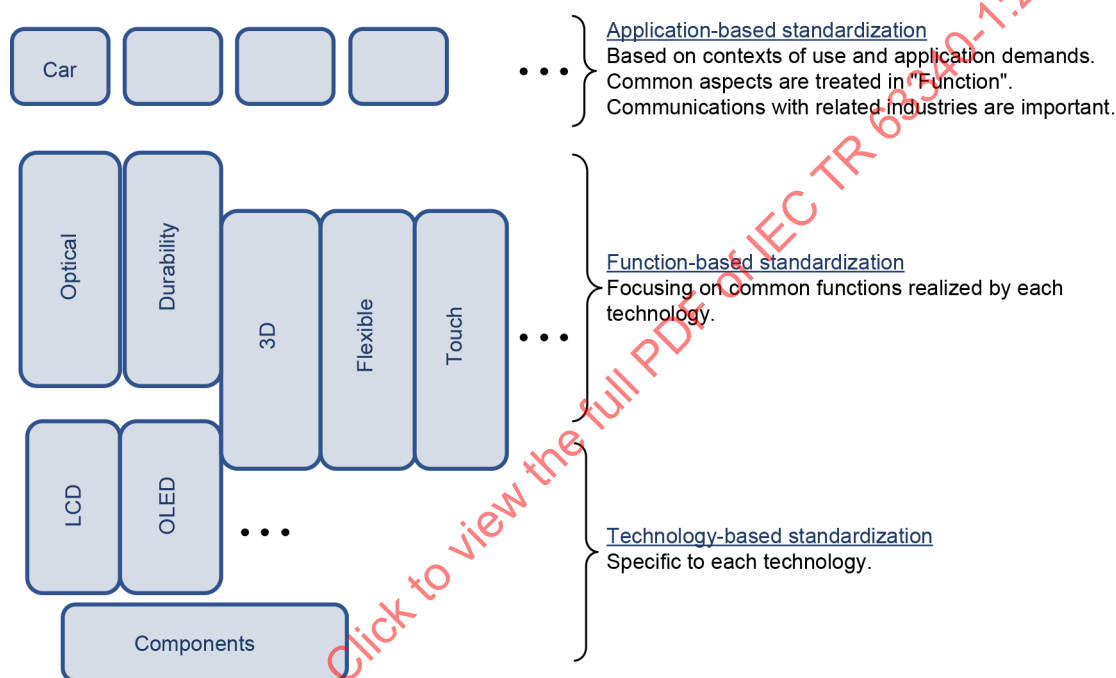
Figure 1 – Standardization approach based on technology, function and application aspects

5   Threshold value stipulation and further improvement issues

There are some concerns regarding the standardization including threshold values. If the requirements or thresholds specific to each application are stipulated, there can be some problems, for example, the thresholds can prevent further improvement.

Meaningless stipulation of requirements or thresholds can be avoided, but in application-based standardizations, they are sometimes necessary in order to keep adaptability. Generally, in such a case, the term "revision" or "version" is applied. For example, IEC 62680-2-1:2015 [2] specifies "Universal Serial Bus Specification, Revision 2.0" and IEC 62680-3-1:2017 [3] "Universal Serial Bus Specification, Revision 3.1". With technology developments, new revisions can be prepared, which serve not to prevent further technical improvements, since in the new standard revision, new requirements or thresholds will be specified.

In some display applications such as medical imaging, office works, road vehicles, and so on, considering how to adapt electric displays to each application, the requirements or thresholds are stipulated. For example, ISO 9241-303 [4] establishes visual display requirements by analyzing work environments and tasks. In the same manner, in general, in order to stipulate requirements and thresholds, it is necessary to analyze how and where to use displays and what to show on displays in each application. Specification items of requirements or thresholds and their values will be different in each application.

6 Collaboration modes with related TCs

Regarding the coordination and allocation of work between TCs, five working modes are defined in ISO/IEC Directives, Part 1:2022 [5], Annex B.

– Mode 1 – Informative relation
– Mode 2 – Contributive relation
– Mode 3 – Subcontracting relation
– Mode 4 – Collaborative relation
– Mode 5 – Integrated liaison

In Mode 1 to 4, one TC takes the lead, while Mode 5 is under a principle of total equality of participation.

Because application standardizations are boundary regions with other TCs, it is important to discuss appropriate working modes and how to collaborate with other TCs considering the standardization points. As defined in ISO/IEC Directives, Part 1:2022 [5], Annex B, for deciding the coordination and allocation mode, "IEC and ISO shall agree through their Technical Management Boards on how the views and interests of the other organization are to be fully taken into account".

7 Application candidate extraction using inventory table

7.1 Purpose and procedure

In order to establish strategies to standardize application fields, possible display applications are enumerated first, and then the candidates to be focused on will be clarified.

The following procedure can be applied in the extraction of application candidates:

1) making a list of application candidates considering related markets and businesses;
2) investigating using an inventory table;
3) evaluating and prioritizing.

The following subclauses explain the details.

7.2 Application candidate list

Various application candidates of displays are shown in Figure 2, considering related markets and businesses. These are display application candidates from which special applications can be extracted. It appears that displays can be used in many fields and purposes. Display applications can be classified into several categories such as "Personal/Wearable", "Medical/Healthcare", "Home/Office/Retail appliances", "Architectural", and "Mobility".
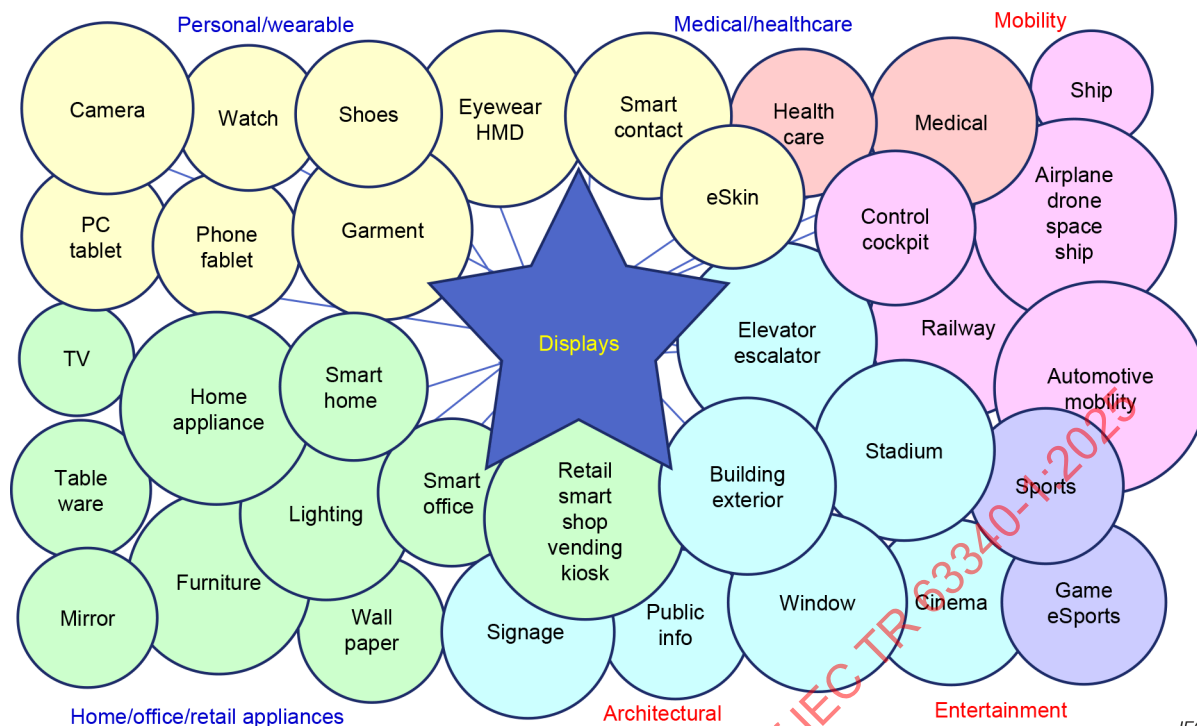
NOTE   The following colour fields show the application categories.

Yellow: Personal/Wearable

Green: Home/Office/Retail appliances

Blue: Architectural

Purple: Entertainment

Magenta: Mobility

Orange: Medical/Healthcare

Figure 2 – Display application candidates to extract special applications

7.3   Inventory table and evaluation

More detailed information on various application candidates shown in Figure 2 is gathered, as shown in Table 1 and Table 2. The points are the following:

– points to be standardized (stakeholders' demand);

– related works in electronic display field;

– related SDO (standard development organization), TCs and their works;

– proposals and justifications;

– priority.

It is important to clarify specific standardization points first, because if there is no point, there is no necessity of standardization activities. The investigations of related works in electronic display field and other related SDO and TCs are effective in order to consider the relation with their existing works. If the current work already covers these specific points, no new work will be necessary. The inventory table provides a starting point to answer the following questions: "which applications?", "for whom?", "what kind of standard?", and "why will the related TC standardize them?".

Table 1 shows the items with low priority, because of existing works in other TC and WGs (working groups) and small market size.

High priority items are summarized in Table 2. The five application candidates are extracted, and the criteria between these priorities are their public and societal natures. The details are explained in 7.4.

Table 1 – Inventory table of display applications with low priority

Application candidate	Stakeholders' demands	Related works in electronic display field	Related SDO and TCs and works	Proposals and justifications
Television		Many projects	IEC TC 100 IEC 60107-7 (HDTV displays) IEC 62087-3 (TV power consumption) IEC TR 62935 (HDR video)	No proposal (or already addressed in existing works)
PC monitor				
Note PC				
Tablet				
Smart phone				
Watch				
Camera (still/video)				
Printer				
Data projector			IEC TC 100 IEC 61947 series	
Medical			IEC SC 62B IEC 62563-1 (Medical display evaluation) IEC 62563-2 (Medical display acceptance)	
Cinema	Tiled display (test condition, pattern, seam measurement, uniformity)		ISO/TC 36	
Stadium (outdoor/indoor)	Tile	There is no WG for "Digital Information Signage"	IEC TC 100/PT 63181, ITU-W3C ISO/IEC JTC 1/SC 34	
Furniture			ISO/TC 136	No proposal (currently no demand for standards)
Garment			IEC TC 124	
Smart workspace			JTC 1/SWG 7 JETI	

**Table 2 – Inventory table of display applications with high priority –
Five extracted application candidates**

Application candidate	Stakeholders' demands	Related works in electronic display field	Related SDO and TCs and works	Proposals and justifications (see 7.4)
Automotive	Arbitrary (non-rectangular) shape display (test condition, pattern, uniformity, legibility, readability)	No WG for "Control and Navigated Information Display"	ISO/TC 22 (Road vehicles) IEC TC 69 (Electrical power/energy transfer systems) IEC TC 125 (e-Transporters)	Vehicle applications (mobility applications)
Airplane (avionics/in-flight entertainment…)	Legibility, readability		ISO/TC 20 (Aircraft and space vehicles) IEC TC 107 (Process management for avionic)	
Ship (yacht, fishing boat…)			ISO/TC 8 (Ships and marine technology) IEC TC 18 (Electrical installations of ships)	
Train			IEC TC 9 (Electrical equipment and systems for railways) ISO/TC 269 (Railway applications)	
Signage (outdoor/indoor)	Save energy, legibility, readability, durability	There is no WG for "Digital Information Signage"	IEC TC 100/PT 63181 ITU-W3C ISO/IEC JTC 1/SC 34 ISO/TC 59 (Building works)	Public and digital information signage (architectural displays)
Public information	Save energy, legibility, readability, durability, emergency information, emergency power supply	There is no WG for "Digital Information Signage"	IEC TC 100/PT 63181 ITU-W3C ISO/IEC JTC 1/SC 34	
Game	Definition and specifications (requirements) for gaming and e-sports displays, specification dependence on game types, measurement and evaluation methods specific to gaming and e-sports displays, relation with e-sports regulations	Some measurement methods (i.e. MPRT).	ISO/TC 83	Gaming/e-sports
Elevator/Escalator	Optical and durability performance requirements and test conditions specific to the structure		ISO/TC 178	Elevator/Escalator
Education	(Under discussion)		ISO/IEC JTC 1/SC 36 (Information technology for learning, education and training)	Education

7.4 Typical examples of prioritized special applications

As a result of the inventory table analysis, the following five candidates are prioritized:

– public and digital information signage (architectural applications);

– vehicle applications (mobility applications);

– elevator/escalator (typical application with both architectural and mobility aspects);

– gaming/e-sports;

– education.

These applications involve the public and societal natures and are strongly related with the contribution toward the SDGs. The possibility that these natures and relations with SDGs demand special requirements is high, which can be effective to prioritize special applications.

The public and digital information signage is closely related with architectures (i.e. building exterior and interior), and regulations exist in some countries. The elevator and escalator are a part of architectures. Vehicle applications help connect cities and communities and contain a public aspect. These three applications can contribute toward SDGs "Goal 11: Sustainable Cities and Communities".

The digital information signage includes not only display hardware aspects, but also service aspects. Rather than the signage standardization, building exterior standardization would be important from the perspective of public infrastructure. ISO/TC 59 standardizes the orientation and information outside and inside of a building including signages and information displays. This will provide good discussion examples.

Regarding the vehicle applications, several application fields are related, and automotive application would be a typical example of these. ISO/TC 22 (Road vehicles) is responsible for standardization issues concerning road vehicles and on-board systems. TC 110, as the relevant IEC committee of this application field, can be requested to amend the TC 110 standards to make them suitable for automotive application based on the agreement between ISO and IEC.

The elevator and escalator field has both aspects of architectures and vehicles (i.e. elevator car). Therefore, it is important that the influence on regulatory compliance is considered carefully. ISO/TC 178 (Lifts, escalators and moving walks) has strong interests in elevator/escalator displays, and recently started the standardization of display indicators embedded in elevators. TC 110 can contribute to this standardization. In addition, the future standard of display modules to be embedded into elevators will be precious for both elevator and display industries, which would be a model case of collaboration with other TCs.

Gaming/e-sports are one of the new markets, and there was neither SDO nor TCs standardizing it at first. Recently, ISO/TC 83 (Sports and other recreational facilities and equipment) has expanded their scope from physical to virtual. This is a good example of promoting standardization on advanced future applications. In addition, in order to make the competition fair, public rules can apply. This is an important role of standards. Gaming/e-sports are helpful to SDGs "Goal 10: Reduce Inequality".

Electronic displays are expected to improve education toward SDGs "Goal 4: Quality Education". ISO/IEC JTC 1/SC 36 (Information technology for learning, education and training) is now proceeding the standardization of virtual education using electronic displays. ISO/IEC JTC 1/SC 29 defines the requirements for electronic displays in order to apply them to the standardization of picture coding, and similarly, ISO/IEC JTC 1/SC 36 will decide on some requirements for electronic displays used in educations. The points to be considered are summarized in Annex B.

8 Possible strategies and schemes for application field standardization

To proceed with the future standardization of the five prioritized application candidates, the following strategies and schemes can be implemented. Figure 3 shows the possible flow of schemes.
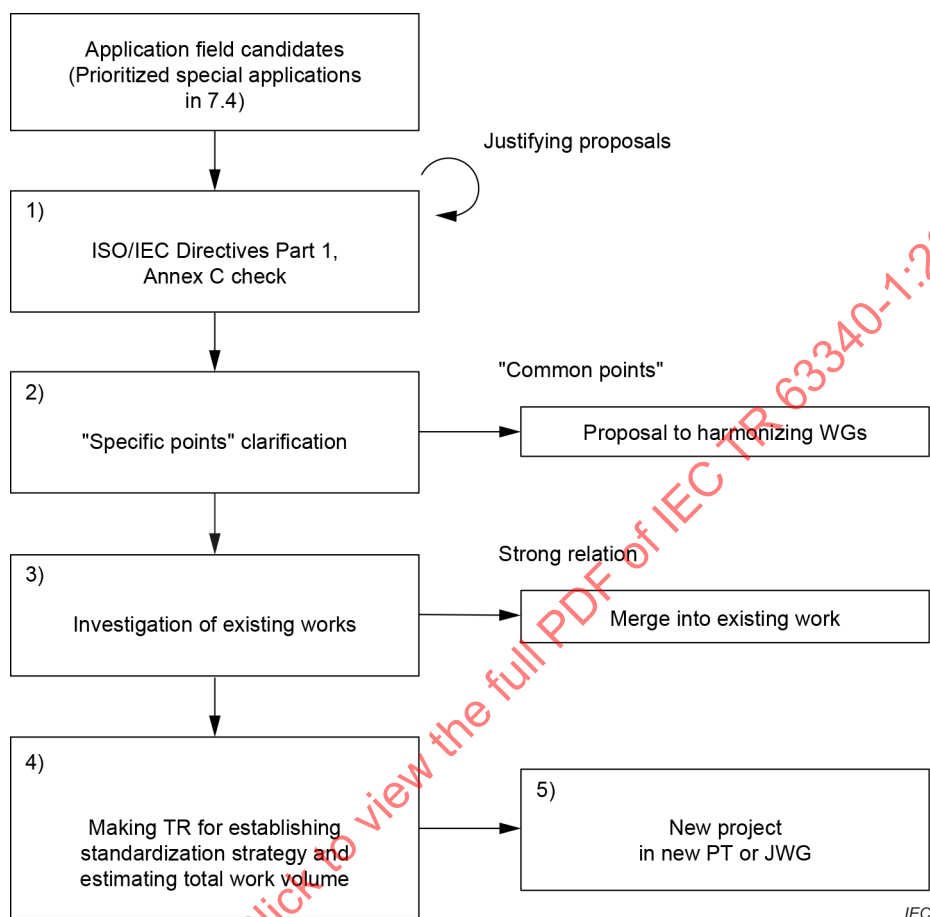
Figure 3 – Possible flow to propose new standardization in application field

1) ISO/IEC Directives 1, Annex C check

First, ISO/IEC Directives, Part 1:2022 [5], Annex C, "Justifications of proposals for the establishment of standards" serves as a basis. In Annex C, the following points are described:

– market relevance,

– need for standardization,

– business, technological, social or environmental issue and benefits,

– relation to and impact on existing work, and

– resources.

These points are important not only for considering NP, but also for specifying application fields. Regarding the market relevance and need for standardization, the existence of a market does not mean a need for standardization. Without the standard, if there is no issue in the market (for example, the technological level of displays is sufficiently high for a certain application), the standardization is not necessary. In addition, there are some cases where international standardization is not possible because domestic regulations are sufficient. For the application standardization, it is important to check the market status and demand for standardization.

Regarding the resources, it is important to gather sufficient participations to proceed.

2) "Specific points" clarification

Next, "application specific" points are clarified.

Common points of measurement and test methods to multiple applications will be standardized in other harmonizing WGs (i.e. in TC 110, WG 13 for Optical measurements and WG 14 for Durability test methods). For example, since vehicular applications have a common durability test item with other applications (i.e. automotive and ship), the harmonizing WGs such as WG 14 would be an appropriate WG. Focusing on "specific" and minimizing "specific" will reduce the work volume.

However, as explained, the application-based approach is based on a "context of use" and an "optimum degree", and it is noted that the consideration of measurement and test methods are not the starting point. Without considering a "context of use" or an "optimum degree", if measurement and test methods are considered, it would cause the proliferation of unused methods. It is important to consider a "context of use" and an "optimum degree" in each application first, and then indispensable measurement and test methods will be considered. As a result, in some related applications, the common points or difference of measurement and test methods will be clarified.

In the application-based approach, requirements, required threshold values, specifications, and blank detail specification will be candidates of "application specific" points. Other application TCs can be appropriate for standardizing the requirements and required threshold values. However, when quantifying the threshold values, measurement and test methods will be necessary. The blank detail specification is useful to standardize specific conditions.

Liaison relations or joint work are effective for these works.

"Specific points" depend on affected sectors of relevant market. For example, in the elevator application, the candidates of affected sectors are regulatory authority, building constructor, elevator vendor, display unit vendor, and display panel vendor. The primary target of the application TC is the displays embedded in elevators, and the standard is applied to the trade between the regulatory authority or building constructor and the elevator vender in order to check whether the embedded displays work properly. On the other hand, for the trade between the elevator vender and display unit vender, a different standard for display unit to be embedded in elevators can be necessary because focusing points of the trades are different. In some cases, different requirements or measurement and test methods can apply. The IEC, as a global, not-for-profit membership organization, whose work underpins quality infrastructure and international trade in electrical and electronic goods, is building standards that can be used for their global trades.

3) Investigation of existing works

Investigation of existing works results in strong relation with other works, the proposals will be merged into the existing work.

4) Making TR for establishing standardization strategy and estimating total work volume

Then, a TR for each application candidate will be prepared in order to establish a standardization strategy and estimate the total work volume. A TR is very effective for discussing future standardizations and will be useful for communications with related TCs, because a TR is very flexible and can include various aspects. Making a TR is also effective for gathering sufficient experts for a future new project.

5) New project in new PT (Project Team) or JWG (Joint Working Group)

Finally, a new project will be started in a new PT or JWG.

The TRs can be started under the same project series number and can be limited to application TRs. If an independent series number becomes appropriate (i.e. a new IS project proposal is approved), it can be changed into a more appropriate series number, even after the TR project has started.

This possible flow shown in Figure 3 is applicable when an additional candidate of special applications will appear in future.