Roles of IEC Standards in Nuclear Knowledge Management

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Abstract

A standard is a document that presents the combined expertise and knowhow of many experts and is designed to provide technical specifications or other precise criteria, such as technical guidance or definitions. The process of standards development itself is similar to knowledge management. Due to lengthy time frames and technical complexity, knowledge management is crucial for the retention of existing skills and development of new ones in the nuclear industry. This paper analyzes the similarities and strengths of international standards in the field of nuclear knowledge management by introducing the procedure of developing IEC standards. Furthermore, it suggests that the nuclear industry could increasingly use IEC standards to facilitate knowledge management.

1. Introduction

Standards represent an agreed documentation for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. They are approved by a recognized body which is responsible for establishing rules, guidelines or characteristics for products or related processes and production methods. International standards are developed by individuals and organizations of diverse backgrounds representing the subject matter, users and developers of a service or product and other interested parties or organizations. As such they are a mechanism for sharing and managing knowledge in a particular field.

Knowledge management itself is defined as an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives. Nuclear Knowledge Management is defined as knowledge management in the nuclear domain [1]. Knowledge Management Systems support nuclear organizations in strengthening and aligning their knowledge. Knowledge is the nuclear energy industry’s most valuable asset and resource, without which the industry cannot operate safely and economically. Nuclear knowledge is also very complex, expensive to acquire and maintain, and easily lost during the long life cycle needed for the nuclear industry. Operating organizations that deploy nuclear technology are responsible for ensuring that the associated nuclear knowledge is maintained and accessible.

This paper explains how IEC International Standards are developed. The importance of IEC standards in the dissemination of scientific and engineering information for knowledge management is further analyzed. Finally it is suggested that IEC standards could be more used as a balanced mechanism for nuclear knowledge management.

2. IEC Standards Development and Its Role in Knowledge Management

The IEC is the global organization that develops and publishes a large number of normative and informative publications for most electrical and electronic devices and systems [2]. To do so it uses a well-controlled process that is a careful balance between speed, to address market needs, and consensus, to encourage broad relevance and usefulness.
At the beginning of a standard lies the real need of an industry. A company or industry in a given country formulates and communicates the need for a new standard to their NC (National Committee). The NC generally knows which TC (technical committee) is in charge of the work and will have the proposal circulated to all the countries which participate in the relevant TC.

The NCs of these countries will then consult with their industry and vote (one vote per country) for or against the development of this new standard. If a majority is in favour of the new standard, then a group of at least five experts from five different countries is needed to initiate work on the new project.

To begin with the group develops a draft which usually goes through several reviews until the experts are happy with the result. At that stage the draft is sent to all IEC NCs, who share it in turn with their industry and other key stakeholders, sometimes organizing a public enquiry. In principle, the NC will accept comments from any stakeholder in the country, no matter whether they participate in the NC or not.

If needed, the draft goes through another stage of reviews to satisfy or address all comments. At the end of this process each country (one vote per country) casts its vote for the Final Draft International Standard. To accept the International Standard, at least 75% of voting countries must have voted yes.

The process for developing standards meets the core principles of the Code of Good Practice of The WTO TBT agreement: transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and addressing the concerns of developing countries [3]. Standards development also facilitates the knowledge management in similar ways as described below.

**Promoting Knowledge Creation (Effectiveness and Relevance)**

When explicit knowledge needs to be applied many times, it can be written down as a common rule, i.e. a standard in its earliest form. It can be regarded as a form of knowledge conversion: from tacit to explicit knowledge, which is very important for knowledge management [4].

Developing an IEC standard requires the organizations to make explicit choices about objectives and procedures in a scientific language and describe them with accurate engineering data. This will make it easier for collecting, storing and sharing of knowledge and, thus, knowledge management.

**Facilitating Knowledge Sharing (Transparency)**

Knowledge sharing is an important aspect for nuclear knowledge management. IEC Standards can cut down on trial and error and start the process from a shared body of knowledge. The risks are mitigated at every stage. IEC standards avoid starting work from scratch.

The IEC International Standards offer a globally accepted set of technical rules and permit access to and benefit from the learning curve of others. IEC Standards are built on each other’s research and stimulate further development of new technologies.

**Enabling Cooperation (Openness)**

The speed of innovation is so fast that individual companies – no matter how big – simply can’t develop everything alone anymore. Increasingly complex systems such as nuclear systems require that many companies cooperate to build them. They bring together the individual solutions of many smaller companies to integrate them into increasingly large systems.

Broad cooperation is only possible when all players use the same set of internationally harmonized rules: IEC International Standards. It is the same for knowledge management. Without these, electrical and electronic devices in the nuclear systems would not be able to connect and work safely with each other.
Highest Quality through Synergy (Impartiality and Consensus)

The IEC International Standards are consensus-based and pass through a stringent process for preparation and approval to ensure they are of the highest quality and represent the know-how of experts from all around the world.

IEC standardization work is accomplished through 178 TCs and SCs (technical committees and subcommittees). The 20 000 or so electrotechnical experts participating in over 1 300 Working Groups come from all around the world. Many are from industry, but there is also participation from government, test and research laboratories, academia and consumer groups. The IEC Collaboration Tool enables IEC officers and experts to connect with other experts around the world and collaborate on their standardization work on-line. The IEC Collaboration Tool also enables the committee to store reports of meetings, discussions so that they are available for consideration by future newcomers in the committee.

Common Language and Universally Understood (Coherence)

The IEC International Standards also offer a globally accepted set of terms and definitions, leaving very little room for misunderstanding. This facilitates common understanding and enables easy transfer in knowledge management.

Best International Practice (Addressing Global Concerns)

The IEC brings together 169 countries. Over 20 000 global experts from industry, governments, testing labs, academia, and elsewhere participate directly in IEC standards development. Many thousands more work in each IEC member country. With its global, neutral platform the IEC is able to provide the technical foundation for global knowledge management in the field of electrotechnology.

IEC has been working on nuclear standardization since the 1950s. IEC TC 45 develops international standards in the field of nuclear instrumentation [5]. The committee consists of several Working Groups (WGs) and two Subcommittees (SCs), SC 45A and SC 45B. SC 45A is of relevance to the International Atomic Energy Agency (IAEA) in that it develops standards for instrumentation, control and electrical systems of nuclear facilities. According to an agreement passed with the IAEA the standards developed by SC 45A rigorously use IAEA terminology and implement high level principles laid down in the IAEA safety guides. More recently SC 45A has started work on security and cybersecurity; this orientation has also been triggered by high level IAEA principles.

The Fukushima events in March 2011 have triggered new discussions and developments in SC 45A as well as reconsideration of existing standards in SC 45A, in this context knowledge management turns out to be of prime importance.

3. Conclusion

IEC standards are an efficient way to identify, transform, develop, share and preserve the highest quality knowledge and the best international practices from the whole world. In their natural form, they provide a universal and integrated solution to facilitate nuclear knowledge management. The nuclear industry is encouraged to increasingly use IEC standards and enhance its participation in IEC standards development.

Reference:


