

# PROJECT REPORT

## Standardising the Internet of Things –

## What the Experts Think

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### **Abstract**

The paper reports some findings of a project that aimed at making initial recommendations on how the standards setting processes for the Internet of Things can be adapted to provide for a level playing field for all stakeholders. To this end, the opinions of experts in the field were compiled through a survey and a ‘study with Delphi elements’.

### **Keywords:**

Standardisation, Internet of Things, survey.

## Introduction and Motivation

The ‘Internet of Things’ (IoT) will represent a paradigm shift in communication: initially, communication occurred between living beings. With ICT, this was complemented, and to some degree replaced, by communication between humans and machines (e.g., through word processing), by communication between humans enabled by machines (e.g., telephones or e-mail), and by machines communicating with each other (e.g., in B2B e-business). The next step will see communication between ‘things’ (e.g., the cooker with the fridge, or the shopping cart with the till), without any human intervention.

To deploy these technologies beneficially for all stakeholders, internationally agreed standards will be a sine-qua-non. This holds all the more as it may be assumed that they will have an unprecedented impact on the environment within which they will have to function. The broad application of RFID technologies, and eventually the IoT, will change people’s lives perhaps even more dramatically than ICT have done so far. The standards setting process will need to reflect this in some way.

Thus, the assumption underlying the project ‘Standardising the Internet of Things’ was that standards setting bodies (SSBs) will need a certain level of legitimacy to develop standards acceptable. And that, as a consequence, it will become essential that all stakeholders can contribute to standardisation activities towards the IoT, and voice their respective requirements and concerns. Specifically, this broad active participation shall be possible *in practice* – in theory (i.e., through their policies and bylaws), the relevant SSBs do not exclude any stakeholders.

The overall objective of the project was

*To make initial recommendations on how to adapt the standards setting processes*

*for the Internet of Things to stakeholders’ requirements*

More specifically, the project

- did a comprehensive state-of-the-art analysis with respect to current standards-setting processes and a classification of different stakeholders' in these processes,
- identified the major standards setting bodies of the (future) IoT standardisation environment,
- developed typical sample application scenarios for the IoT,
- did two empirical studies to compile further up-to-date information and views,
- developed recommendations on how standards setting bodies (SSBs) can be aligned, and their processes modified, to accommodate the requirements of the IoT.

This report will focus on the latter two aspects<sup>i</sup>.

## **The Studies and their Findings**

### **Methods**

Neither have all stakeholders in the standardisation of the IoT been created equal, nor do they exert an equal level of influence on the process. Specifically, the 'Third Estate'<sup>ii</sup> in standardisation, i.e., primarily SME user companies and consumers, hardly ever have the opportunity to make themselves heard.

We carried out an exploratory survey and a 'study with Delphi elements'. For the former, a semi-structured questionnaire sent to around 80 experienced standards setters, with typically 6 – 12 years of relevant experience. The vast majority gained much of this experience through working in ISO JTC1 SC31. Many have also been active in EPCglobal. In total, we received 12 replies (including 3 from ETSI, EPCglobal and CEN).

The 'study with Delphi elements' comprised two rounds. While the study consisted numerous Delphi elements. it did not ask experts to evaluate the probabilities of different scenarios.

Rather, the study presented an application scenario of the IoT, and asked for the experts' views on different aspects in relation to this scenario. The second round analysed those answers of the first round for which very diverging views had been expressed. We asked those questions again, showing the experts the results of the first round, and gave them the opportunity to adapt their answers and/or comment on their responses. We also added some new questions in response to answers and comments given in the first round. In total, 26 experts (standardisation researchers or active WG members) volunteered. Of these, 20 actually participated in round one; 17 in round two.

## **Findings**

Apparently, today's standards setting processes may be considered as largely adequate overall. This holds despite a wide agreement that consumers and SME users should be represented in the process, which they not necessarily are. Also, the process is (inevitably) dominated by large manufacturers / solution providers. Moreover, the RFID/IoT standardisation environment seems to be stable; respondents didn't identify possible new players in the field of IoT standardisation.

There are, however, a number of caveats. For one, the 'Third Estate' in ICT standardisation is far from being adequately represented in the standardisation process towards the IoT. That is, (small) user companies and, particularly, consumers are hardly, if at all, represented in the standards working groups. This finding is pretty much in line with those of earlier studies in the ICT sector (see, e.g., [Jakobs, 2004], [Gerst & Jakobs, 2007]). In this case, however, the fact that especially consumers are not (adequately) represented is a major problem, as they are likely to be even more affected by the IoT than by 'traditional' ICT systems.

However, representation is not just about head counts. The technical, rhetoric and diplomatic abilities of any representative are important in order to be taken serious. Likewise, taking over responsibilities (in the form of, for example, editor, WG chair, etc) is important. Unfortunately,

(for the ‘Third Estate’), such capable individuals are typically to be found on the payrolls of large manufacturers and solution providers [Jakobs, 2010].

Along similar lines we note that informal barriers exist that keep members of the ‘Third Estate’ from active participation in standards setting. The foremost obstacle is an apparent lack of resources, with respect to:

- **Funding:** Many WGs tend to meet in remote places (from a European point of view). Moreover, full-time participation in the process is necessary for anyone who wants to offer meaningful contributions. This, in turn, implies that at least one employee will only work on standards-related issues; money that small companies and consumer organisations will hardly be able to get together.
- **Human resources:** There is an observable trend of experienced, and respected, standards setters gravitating from small(ish) companies or from the research realm towards large vendors. This further corroborates the inequality of influence in the standardisation process.
- **Knowledge:** Small companies, let alone consumers, only possess an inadequate knowledge about the – fairly complex – European standardisation environment, let alone the international one. Likewise, little is typically known about the importance of standards, and about the difference active participation in the process may make (in terms of, for example, competitive advantage to be gained, new markets to be identified).

Competition and co-operation between SSBs may well occur in parallel (e.g., between ISO and EPCglobal and IEEE, respectively). Obviously, the latter is bad for most stakeholders. Competing standards may paralyse markets – users and consumers will wait for a dominant technology to emerge. This, in turn, may negatively impact their competitiveness, as they will be locked into old technology. To avoid such a situation, co-ordination between SSBs is

necessary. Such co-ordination does exist, both formally and informally. Regarding the former, various formal ‘contracts’ exist. These include, for instance, the World Standards Cooperation (WSC) that governs the relations between the international bodies ISO, IEC, and ITU. Similarly, the Vienna Agreement [ISO, 2001] provided the basis for the co-ordination of the work done within CEN and ISO. EPCglobal is an ‘Approved Referenced Specifications Originator Organization’ of JTC1, and IEEE and ISO have signed an ‘ISO/IEEE Partnership Standards Development Organization’ (PSDO) agreement.

Perhaps even more importantly, co-ordination is achieved through an exchange of documents and through individuals that are active in several SSBs working on related subjects (see also e.g., [Jakobs, 2008]),

### **Initial Recommendations**

From the above, a number of initial recommendations can be developed. There is broad agreement that ISO is playing a crucial role in the process, and that the links from other SSBs to ISO are said to become increasingly stronger. In other sectors, we may also observe distributed standardisation processes co-ordinated by a single organisation. This is the case, for example, in the standardisation of 4G technology. Here, ITU-R have issued a list of requirements any future such systems will have to meet. They are now collecting proposals from other bodies, and will decide about the winning proposal. Thus, our first initial recommendation would be:

*Establish ISO as lead organisation to co-ordinate the IoT standardisation process.*

However, this representation must not repeat the mistakes from the past. That is, it must not be static. Both ISO and ITU had ‘requirements groups’ in place that were supposed to provide the ‘technical’ WGs with real-world requirements. Both were abandoned eventually, largely because of a perceived lack of credibility [9]. Rather, representation needs to be ‘dynamic’,

i.e., continuous throughout the process. That is, technically savvy champions are needed who adopt the users'/consumers' point of view; they don't necessarily need to actually be users/consumers. Such representation would require external funding (specifically for consumer representatives; funding should not go to individuals, but to umbrella organisations, though). Thus, we would suggest to

*Provide funding to have small users and consumers be represented throughout the process by dedicated, knowledgeable champions.*

There is, however, one drawback to this: there is no such thing as 'the' user or 'the' consumer. That is, there is a real risk of user/consumer representatives facing legitimacy issues (not unlike the problems that led to the dissolution of ITU's and ISO's requirements groups).

We can identify a whole range of stakeholders, many of whom do not necessarily catch your eye. It would be less than practical to have them all directly represented in standards setting. Here, a more indirect approach will be needed. Accordingly,

*Establish a 'hierarchical' representation of (small) indirect stakeholders.*

These are more contributions to an ongoing discussion than 'proper' recommendations. They may also serve as hypotheses for a follow-up research project. However, they are all backed by the project findings that in turn are largely based on the knowledge and views of experienced standards setters, and of those who have worked in standardisation research for quite a while. Moreover, we have used two separate research methods to support our conclusions which additionally increases our confidence in their validity. We thus feel that these ideas, while perhaps sometimes a bit provocative and out of the ordinary, are worth being discussed.

## References

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<sup>i</sup> The full final report is available from the authors upon request.

<sup>ii</sup> In pre-revolutionary France everyone that was neither clergy nor aristocracy (i.e., about 98% of the people) belonged to the Third Estate. They didn't have any say at all in state affairs.