Agency or structure in institutional work; A case of standard drafting in an international standardization body

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ABSTRACT

In this paper, we question the institutional entrepreneur agency in standardization . Firms are called to participate in the standardization process to propose projects for new standards However, entering the standardization process demands to undertake actions that may lead to failure or success.

Based on a research action approach, we follow two projects belonging to the same domain from the inside of a Technical Committee within the International Standardization Organization (ISO). One succeeds while the other fails. This leads us to specifically describe the actions undertaken step by step and to question the entrepreneur agency.

Our findings clarify the layout between agency and structure in the institutional work in standardization bodies. Standardization limits its agency through the cultural, socio structure and socio psychological contexts. However, the institutional collective entrepreneur can develop his agency through framing the context, enacting a collaborative network, facilitating institutional arrangements, enacting the political and collective process.

Keywords: Institutional work, institutional entrepreneurship, standardization, agency

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INTRODUCTION

What[A1] are the specific rules operating and more specifically how can a technical committee play a collective entrepreneurial role to shape a standard within a Standard Development Organisation (SDO)? While companies are more and more often asked to take actions and to contribute to the development of standards, we note that success is not always guaranteed and that companies are not always able to guarantee the publication of a standard. In this research, we analyse the agency/structure tensions in the institutional work (Lawrence and Suddaby, 2010) [A2]achieved in a standardization body (International Standard Organization, ISO) to draft a new project of standard. We consider that the institutional work succeeds when it leads to a new norm and that it fails when no norm is issued from the process By using two standard projects in standard development organizations (SDOs) as cases for comparison (one is successful in publishing an international standard while the other fails to do so), we aim at understanding why a standard proposal would succeed or fail to become a standard so as to bring a better understanding of the institutional work in standardization body and the opportunities and limits it constitutes to institutional entrepreneurs. Adopting research action method, we definitively choose to go deep into the process and we aim at contributing to the theoretical agency/structure debate in institutional work.

Indeed, standard development, as a formal process, is drawing more and more attention as formal voluntary standards play an important regulatory role in the worldwide economy. Thibierge (2014) identifies a serious "densification" of standardisation. The author enumerates 20 000 standards in 2012, 1 800 new standards per year, 650 000 international technical standards (Perinorm). This densification calls for a better knowledge of the standard drafting process in Standard Development Organisations. Specifically, considering the increasing role of voluntary formal standards - standards that are shaped in Standard Development

Organisations (SDOs) - there is a growing need of knowing how the process really does work.

Formal standardisation is a voluntary process to draft standards giving common references for a market. The process consists in providing technical devices, measures, definitions that will enable industry players, suppliers, consumers, distributors, and all the stakeholders to use the same language. The point here is that the institutional process depends on the involvement of private firms as well as market stakeholders. The members representing the standardisation bodies (ISO, IEC, AFNOR, CEN/CENELEC) carry out their duties in order to motivate them and to organise the conditions of a collective and consensual setting of a formal standard. However, as standardisation requires time and money, the firms may enter such a process involvement only if they find an advantage in this contribution. The motivations for firms to participate in the standardisation process have been studied through literature (Blind, 2016; Leiponen, 2008; Weiss and Sirbu, 1990, Mione, 1994, 2009). They range from a search of legitimacy, business intelligence and innovation scanning to influencing in order to favor their technological advance. However, very little is known about the actions firms may undertake within the standardisation process in order to actively contribute to the standardisation process.

This knowledge is all the most important as the international competition between companies, markets, drastically reduces the time usually needed between the initial idea and the introduction of a new product, or process, or service on the market. Innovation, standard development – when applicable -- are important stages of this product or service development process. In highly competitive fields, such as Information technologies, business-oriented requirements, but also available techniques are evolving very quickly, sometimes leading to a kind of speed race between the different stages of the development process. The question we ask is how should firms be aware of this in order to increase their institutional work ? In other words, what should they consider first and how could they prioritize their institutional actions with the objective of increasing their chance to get a standard ?

Our theoretical approach is anchored on institutional work. The participants contributing to drafting a standard are identified as "institutional entrepreneurs" (Narayanan and Chen, 2012). The authors considered the relation towards others to organize collaboration as an interesting dimension to explore during the standard development process. To observe such interaction, we build on the concept of institutional entrepreneurship defined by Di Maggio (1988)

Institutional entrepreneurs are defined as "organized actors with sufficient resources who see in new institutions an opportunity to realize interests that they value highly" (DiMaggio, 1988, p. 14), From that definition, researchers have shown how individuals, organizations (Lawrence, 1999), networks (Dorado, 2005) or social movements (Lounsbury, Ventresca & Hirsch, 2003) can affect institutional arrangements. Institutional entrepreneurs can influence new organizational forms (Thornton, 2002), practices (Boxenbaum & Battilana, 2005), formal regulatory arrangements such as environmental regulatory conventions (Maguire & Hardy, 2006), climate policy (Wijen & Ansari, 2007) or EU policy (Fligstein, 2001), and formal ISO norms like the subject of the present study. In this contribution, we observe how institutional entrepreneurs act in order to realize a new norm drafting. We specifically observe the leading role of the coordinator who is the expert designed by the SDO (ISO) and aim at identifying its agency within a standardization committee.

Our perspective is original as we examine the institutional process in a strategic way and we analyse it in terms of failure or success. For this purpose, we examine two real test cases:
- the standardisation process of the information structure of RFID tags and
- the standardisation of information modelling for shop floor data acquisition.

We make an in-depth analysis of the ISO standardisation process from the early beginning of the project to the standardisation procedures within the ISO Working group. We adopt the observing method of institutional work (Benslimane et Lecas, 2006) and we use Dumez and Jeunemaitre (2005) strategic sequential sequences to enlighten the decision to standardise and the strategy to manage the standardisation process. We focus on those two particular examples since one is a success (ending with the publication of the International Standard) while the other one is a failure : the standardisation process could not succeed in drafting a formal standard. In this contribution we analyse the reasons of the success, or the failure.

The first part exposes litterature review on institutional entrepreneurship and work and we specifically explore institutional work within the specific domain of international standardization. We choose this sector because it constitutes a highly institutionalized unified field (Battilana et al, 2009). We find specifically interesting to examine the creation of a technical standard with observing its emergence and creation through the context of a standardization body. We aim at identifying the degree of freedom left by such an institutionalized context through the lens of the agency concept. The second section exposes

the method. We employed a research action method which enables us to observe the process from the inside. We describe the two standards projects and explain the data collection and analysis. The third part provides our results and findings. We present this agency from two perspectives. We first explain how the standardization process influences the entrepreneur and limits its agency through the cultural, socio structure and socio psychological contexts. We then show how he can he develop his agency through framing the context, enacting a collaborative network, facilitating institutional arrangements, enacting the political and collective process.

1. AGENCY IN STANDARDIZATION INSTITUTIONAL WORK

1.1. AGENCY AND INSTITUTION[A3]

Literature has long debated on how actors relate to institutions (Emirbayer et Mische, 1998; Abdenadour et al, 2017). Original institutional perspective (Meyer and Rowan, 1977; DiMaggio et Powell, 1983; Fligstein, 1985) enlightened the structuring effect that institutions apply on the actors' perceptions, decisions and actions. In this perspective, the actors and their agency are subordinate to institutions. However, nuances were brought (Di Maggio, 1988) that questioned the conception of agency as a causal force and asked for empirical studies of institutionalization. This critique inspired a veritable turn for institutional theory towards agency-centered theories and empirical studies (Beckert, 1999; Dorado, 2005). Our contribution anchors in this "agentic turn" (Abdenadour et al., 2017). It includes literature on institutional entrepreneurship (Battilana, Lecas et Boxenbaum, 2009; Greenwood and Suddaby, 2006; Leca and Naccache, 2006), institutional work (Lawrence and Suddaby, 2006; Lawrence, Suddaby and Leca, 2009, 2011; Zeitsma and Lawrence, 2010) and theories analyzing the active involvement of actors in institutional change and reproduction (Grennwood, Oliver, Sahlin-Andersson and Suddaby, 2008). This agency-oriented research focuses on the leeway left to actors to interpret rules and enact institutional patterns. It is based on Emribayer and Mische (1998) definition of human agency that describes agency as the temporally constructed engagement by actors of different structural environments – the temporal-relational contexts of action – which, through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in interactive response to the problems posed by changing historical situations (p. 970). Human agency is both constrained and enabled through three institutional

contexts : cultural, social-structural and social-psychological. Culture refers to symbolic patterns, social discourses and narratives : it enables or limit the understanding and representation of the world and the possibilities within it. Social structures define interpersonal, interorganizational or transnational patterns of actions. They comprehend networks and social ties that constrain or enable actions. Social psychology authorizes or inhibits actions.

In this movement, institutional entrepreneurhip contributed to reinstate agency into institutional theory (Abdenour et al, 2017). This process might be seen as an outcome of the practice turn in management and organization studies (Whittington, 2006). Numerous authors have endeavored to reintroduce agency to institutional sociology (Battilana 2006; Beckert 1999; Garud, Hardy and Maguire 2007; Hardy and Maguire 2008; Lounsbury and Crumley 2007; Mutch 2007). This gives authors the opportunity to explain change endogenously (Battilana 2006; Greenwood and Suddaby 2006) and to emphasise the role of power and politics in institutional change (Garud, Hardy and Maguire 2007; Levy and Scully 2007; Zilber 2007). Most of the authors in this perspective describe cases of entrepreneurs who are creator of institutions (Child, Lua and Tsai 2007; Clemens and Cook 1999; Fligstein 2001; Garud, Hardy and Maguire 2007; Garud, Jain and Kumaraswamy 2002; Levy and Scully 2007; Lounsbury and Crumley 2007; Mutch 2007; Perkmann and Spicer 2007; Wijen and Ansari 2007; Zilber 2007). Only few looks at entrepreneurs' roles in institutional change and even lesser are entrepreneurs that are maintaining institutions (Fligstein 2001; Zilber 2007) or that are solely destroying institutions (Maguire and Hardy 2009).

In this perspective, institutional entrepreneurs are generally considered as agents pursuing certain interests and acting strategically (Beckert 1999; Child, Lu and Tsai 2007; Fligstein 2001; Garud, Hardy and Maguire 2007; Greenwood and Suddaby 2006; Lawrence and Phillips 2004; Levy and Scully 2007; Misangyi, Weaver and Elms 2008; Wijen and Ansari 2007). This is in line with DiMaggio's initial formulation and his emphasis on human interest: "New institutions arise when organized actors with sufficient resources (institutional entrepreneurs) see in them an opportunity to realize interests that they value highly" (1988:14).

The relation between agency and institution however remains complex and Lawrence and Suddaby (2006) proposed to renounce to the expression "institutional entrepreneurship" and proposed institutional work in order to direct research away from the "hypermuscular

entrepreneur" (Lawrence, Suddaby and Leca, 2009). It is described as "the purposive action of individuals and organizations aimed at creating, maintaining, and disrupting institutions" (Lawrence and Suddaby 2006:17). Subsequently, however, the authors provide some more focus by stressing that their main aim is to highlight the awareness and reflexivity of actors, understanding institutions as constituted by conscious action of actors (in line with Giddens's bracketing), and conceptualising action from a practice perspective (Lawrence, Suddaby and Leca 2009:7). In our contribution, we consider that institutional collective entrepreneurship that is realized by the technical committee but we observe more specifically the coordinator role to lead the technical committee and implement actions to draft the norm. We are specifically interested in the schedule of time and we compare the sessions of the two projects for identifying what depends upon the institutional entrepreneurship of the technical committee and what is not under it control. This analysis enables us delimitating its agency which is at the moment absolutely unknown by the public and which was not explored by researches on the standardization field.

1.2 AGENCY IN THE STANDARDIZATION PROCESS

Creating a new standard has already been defined as the creation of an institution and Standardization as a process has been observed by Garud et al (2002) in the institutional perspective through the case of Java. Garud explains that his specific interest to us is the role of actors in shaping emerging institutions (Christensen, Karnøe, Pedersen & Dobbin 1997; Scott & Christensen, 1995). He considers the two theoretical foundations of bringing actors back into a theory of institution creation (Fligstein, 1999). The first one borrows from economic theories such as game theory and other models of rational action but this view discounts the messy, political processes involved and can easily lead to a post-hoc, rationalized view of how institutions emerge. The view chosen by Garud et al (2002) is to employ the tenets of institutional theory in organizational analysis and explore how actors build their goals and procedures directly into emerging institutions (Hirsch, 1975; Meyer & Rowan, 1977). Garud et al (2002) searches for the "skilled performances" of social actors that lie at the core of the production and reproduction of social life (Giddens, 1979).

Finally, Garud et al (2007) describe institutional entrepreneurship as institutional theory infused with an entrepreneurial worldview. Though they embrace the definition of agency by Emirbayer

and Mische (1998), they focus on the activities of actors who purposefully leverage resources to create or transform institutions (e.g. new systems of meaning) over the cultural and network contexts within which actors are embedded. Drawing on the work of DiMaggio (1988), they argue that institutional entrepreneurship reintroduces agency, interests and power into institutional analyses of organization (Garud et al, 2007, p. 957).

Lawrence and Suddaby (2006) describe strategies to create, maintain or destabilise institutions. In this large spectrum of practices, we focus on the creation of the institution and especially on the "defining" form of institutional work. In this perspective, Lawrence and Suddaby (2006) recommend specific actions : "advocacy, defining, vesting, constructing identity, changing normative association, constructive normative networks, mimicry, theorising, educating" (Lawrence and Suddaby, 2006). According to Narayanan and Chen (2012), firms developing standards can be thought of as "institutional entrepreneurs" whose innovation is intended to dislodge established institutions in the technological field. This includes legitimacy-building efforts (Suchman, 1995; Jain and George, 2007), drafting discourse within a field (Munir and Phillips, 2005; Zilber, 2007) as well as the deployment of social and political skills (Fligstein, 2001; Garud et al., 2002). As noted by Jain (2012) applying these concepts to activities taking place within standards development organisations appears a natural fit. In this context, an institutional entrepreneur faces four sets of challenges (Hargrave and Van De Ven, 2006). The first is *the framing context ;* a technological change introduces a rivaling new technology, and therefore, an institutional entrepreneur will compete to establish the legitimacy of its own technological trajectory in the public domain. The second challenge is to *enact a collaborative network* of firms whose products and/or services are critical for the success of a core technology standard controlled by the institutional entrepreneur. Third, the institutional entrepreneur must facilitate *institutional arrangements* such as regulating systems and resources allocation. Finally, the institutional entrepreneur *must enact the political and collective processes* through which standards emerge. These four sets of challenges (Hargrave and Van De Ven, 2006) can be complemented by the three specific actions identified by Weick (2011) who made a review on institutional entrepreneurship : mobilise resource, mobilise other actors and create meaning.

In terms of literature review we conclude on some elements : first, the increasing role deserved by voluntary standards to regulate international trade creates the need for a better knowledge of the standard development process. Then, the commitment of the company on the process

requires further analyses. Which firms and for which reasons do firms participate in SDOs have been explored (Blind, 2016; Riillo, 2013; Leiponen, 2008, Mione, 1994, 2009), but how can they conceive, shape and support a standard all along the development process remains insufficiently known. To examine the agency, we explore how a standardisation project is proposed and developed within a Technical Committee. Some authors have described the organisation of forums as well as the activities taking place within them (Cargill, 1989; Libicki, 1995; Jakobs et al., 2001). However, we consider that a real description from inside the SDO has not been achieved yet. Jain (2012) addresses the specific question of the situation of anticipatory standards in the situation of innovation and wonders how the committees can anticipate the new markets organisations are going to face. Yami et al (2015) observe the actions undertaken within the committee by Microsoft in the OXML format standard. But no studies adopted the perspective of the entrepreneur and the technical comity to describe the process from the inside. Finally, in spite of the rich insights of previous analyses led within the SDO process, we still miss a specific description of the actions undertaken within a committee in order to shape, to influence and to lead a standardisation project. In order to better understand the institutional work required by such a process we consider a process that could not reach its objective of setting a standard. We deeply examine all the actions in the different phases and propose an explanation.

2. METHOD

To explore institutional work and entrepreneurship we collect original data from inside the technical committee of a international standardization organization (ISO). To bring robustness in our findings, we observe the process of drafting new standards in two real cases. For both projects, the institutional work is done by the same technical committee : the team in charge of the development of the two standards (ISO TC 184 SC4 / JWG8) are composed of the same experts, the SC4 representatives were the same, too (Chairman, Secretary and PPC – Policy and Planning Committee -- members) and none of those SC4 representatives complained about the quality of the documents provided (formal NP proposal).

2.1. Description of the case studies

We base our observations on two standard projects :

- project 1 : information structure of the RFID tags (planned as a future ISO 15531-51 part),
- project 2 : information model of shop floor data (developed as ISO 15531-44 part).

2.1.1 RFID tags

A tag is a memory providing storage facility up to more than 32 000 characters without any contact. A complete RFID solution is composed of tags, readers, interfaces and a middleware allowing the integration of the RFID solution into the company information system. Tags are used extensively in industry, however most of the time the information contained in the tag is stored without any pre-defined structure, thus giving rise to important waste of space and huge interoperability problems. On the contrary, structured tags allow to store locally the data model (or a part of it) related to the product, thus enabling to fetch the corresponding information applicable to the product without having to connect to a distant database, whence a significant reduction of errors, particularly when compared to barcodes. They also facilitate the automation of logistic processes, such as real-time inventory management and supplier management. The innovation – this does not exist in industry today – lies in the possibility to read/write structured data on the tag, thus enabling easy modifications and update of the information contained. This is made possible independently of the devices used for reading/writing the information of the tag. Since the information of the tag is structured, interoperability is possible as soon as the data model is shared among the different systems using the tag content.

Structured RFID tags offer multiple reading/writing possibilities ; this system has been developed within Schneider Electric in order to enable data exchange across production and assembly lines by the PLC, PC, tablets. The benefit of this use is to enable modifications of data during the production process, as required, when and where necessary. Another important benefit offered by the use of structured RFID tags is to enable traceability of the information related to the product without altering read-only data.

This project, based on the analysis of industrial needs was first internally developed within Schneider Electric plants (Dayton, USA and Batam, Indonesia), then extended to different economic sectors, thus leading to the future elaboration of the international standard ISO 15531-5x. This standard falls within the framework of the work already done with the ISO 15531 MANDATE (MANufacturing DATa Exchange) standard, in the domain of production management data. ISO 15531-5x is aimed at providing a standardised exchange format of the information contained in RFID tags, thus enabling providers of software and device tools to

exchange and to share the information of the tags.

2.1.2 Information modelling for shop floor data acquisition

The data acquisition process in a shop floor collects data at the shop floor level, it then provides their identification and their content before their provision to the manufacturing management level. Those data may address: equipment, batches, products or staff. They are requested for the KPI (key-performance indicators) calculations, for the manufacturing and quality monitoring and for the improvement of manufacturing operations. They enable also the validation of shop floor models and scheduling scenarios. The compliance to a model facilitates the collection and the organisation as well as the handling of the data in the database built at the manufacturing management level for historic and management purpose and the set up of shop floor monitoring systems. It also contributes to improve the interoperability of the information. If the data model is standardised, it offers the opportunity to extend the interoperability capacity to a wide range of production lines, shop floors, plants and, given the genericity of the methodology used for the development of the data acquisition system, it becomes thus possible to implement a kind of tracking system providing a precise, accurate – and up-to-date – view on high level business functions of the enterprise (Cutting-Decelle *et al.*, 2012). This standardisation work led to the development of the ISO 15531-44 part.

2.2. Data collection and analyses

We collected data from an in-depth analysis of those two case studies based on deep interviews and from the participative observation from one of the author who participated into the process. The standard development process lasted 3 years. Twelve four-hour meetings have been organised to scrutinise the different phases of the standardisation institutional process from the inside.

The follow-up of this analysis has been done on strict bases from the early beginning of the project to the present situation, which took three years. Our main objective was to collect information on time. The authors were able to identify and to follow all the stages of the maturation process from the innovative idea through to the development of the standard, step by step. Those steps are :

- phase 1 : the idea, the intent to standardise ;

- phase 2 : proposal of a New Work Item (NWI) : initial documents to be completed by the authors of the future standard prior to any discussion and to be voted together with (or not) a first proposal of a working draft (WD) document ;
- phase 3 : initial vote on the NWI (and WD if any) during a plenary session ;
- phase 4 : then, the countries have a time period (around 3 months) to analyze and to provide comments on the documents, those comments will then be solved during the following meetings. During the initial stages of the voting procedures, the comments can be either technical, or editorial. Both need to be taken into account and solved during working sessions of the working group in charge of the development of the standard. The results of the comments' resolution are published by the WG and circulated among the other members of the parent standardisation committee.
- phase 5 : According to the results of the votes and the starting point of the ballot procedure, the future standard then becomes CD (Committee Draft), DIS (Draft International Standard) and finally IS (International Standard) (see Fig. 5 for the target dates according to the different stages)

We fully describe this process in the Annex 1. The standardisation process is a very heavy, formal and formalised process, whence the time necessary from the first idea of a new standard proposal, to the publication as IS (International Standard). We reported all the dates for the different steps in order to compare the programme of work and the corresponding schedule had been applied to the two standards subject of the study, successfully for one of them, leading to a failure for the other one.

The sources are presented on the figure 1 below.

Primary sources	
Primary sources : with direct access to the documents since two of the authors are direct participants in the standardization process	
First hand institutional sources	- NWI (New work item) proposal, WD, first version according to the ISO format - Mail exchanged - Meetings / discussions reports : technical questions - Participants - votes
First hand Industrial sources (Schneider El.)	- Technical reports - Professional documents : problem statement - Organisation of lessons on RFID and practical sessions for the students - Strategic objectives : seen/described during the visits of the plant - Work with the students, organisation of meetings / discussions during 3

	years, visit of the plant once a year for the group of students : around 40 hours per year
First hand technical sources	Work and technical reports made by students from Ecole Centrale de Lille / IG2I during 3 years, 2014, 2015, 2016 : (around 1 000 hrs per year) - special training on standardization, standardization process, SDOs, standards, for the group of students working on the project - project management report, specifications report, quality report, deliverables, videos, brochures, questionnaires, Powerpoint presentations, meetings/discussions reports, visit report, user guides, requirements definitions, mock-ups and software developments, …
First hand marketing sources	Marketing survey made by students in 2015
Secondary sources	
Institutional offical websites	ISO Directives (ref) ---- around 500 pages – ISO web site and portal

Fig. 1 : Primary and secondary sources

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Table 2: Projects and Skills in Institutional Entrepreneurship

Project	Activities	Skills	Outcome
Interactional	Networking Resource mobilization Organization building	Political	Innovative organizational form
Technical	Studying Analysing Designing	Analytical	Theorization of organizational form
Cultural	Framing Propagating Advising Teaching	Cultural	Diffusion of organizational form

3. RESULTS

3.1 INSTITUTIONAL WORK IN STANDARDIZATION PROCESS

Given the different stages of the standardisation process, the publication of an international standard can be considered as an obstacle course, starting from initial idea through to the publication of the final document. The two situations described in the two case studies present a lot of similarities, among which the same context, the same committee in charge of the work, and the same need for standards expressed by the industrial company. In both cases, The motivations of the industrial company (Schneider Electric) were the same : to provide standardized solutions facilitating communications between industrial equipments/machines

widespread on the global market. The existence of standardized solutions helps to enlarge the potential demand and contributes to increase their potential markets. However, both do not obtain the same result. For the two projects, we have observed and compared the institutional work and agency and we present here the results of our observations and learning on the institutional work.

3.1.1 Institutional work performance

For the two projects, we have collected the different dates then compared the evolution of the two standardization processes (time lines).

- **Time line of the MANDATE 15531-44 part** (Information modelling for shop floor data acquisition) : the stages (with the corresponding dates) of the development process of the standard were the following :

  - NWI, NP (New work item, New proposal) : June 2006, with WD
  - WD2 (Working draft, second version), WD3, WD4 : from July 2007 to March 2008
  - CD (Committee draft) package : September 2008
  - DIS (Draft international standard) v8 : December 2009
  - IS (International standard) : May 2010

  The time line with the different stages is represented Fig. 2 below :

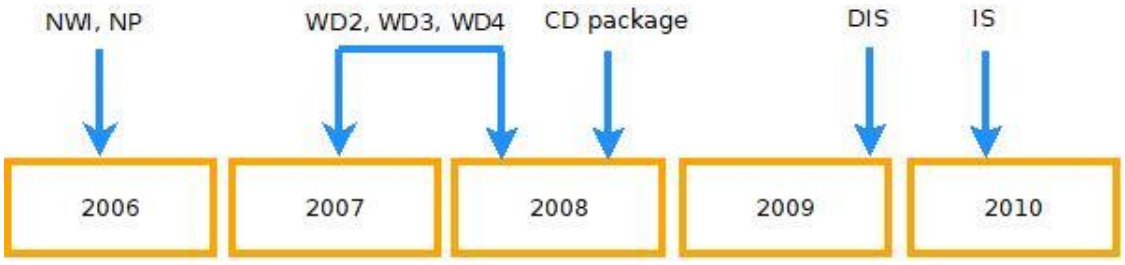

Fig. 2 : Time line of the ISO 15531-44 part

We may notice the length, the duration of the standardization process : this is due to the fact that several technical modifications have been made during the initial stages (Working draft) : since the standard development process was done in parallel with the industrial implementation by Schneider Electric, it looked very important to us to check the content of the future standard, in a real industrial use, as it has developed.

Time line of the ISO 15531-51 part : A previous work was done by one of the authors of the paper in a plant of his company, a first study was achieved during the academic year 2015-2016 (from September 2015 to the end of January 2016), in a collaborative project between the company and an Engineering School (Ecole Centrale de Lille / IG2I). This project was aimed at providing an overall approach of the industrial needs in this domain, through discussions with potential end users ; another objective was to analyse potential overlaps and/or gaps with existing work and developments, particularly in terms of standardisation and existing standards. Since no potential overlap was identified with existing standards, the final aim of the project was to provide a formal document that could be used as a first proposal of a new part (Part ISO 15531-51) of an existing standard, ISO 15531 MANDATE.

- The NWIP (New Work Item Proposal) ISO 15531-51 was then presented as a NP (New Proposal) during the ISO TC 184 SC4 meeting held in Sapporo, Japan, in May 2016 : one of the authors of this paper was the presenter of the NP. During this meeting, even though all the documents to be provided in order to go through the voting procedure were fully documented, the technical committee were asked to withdraw our proposal, since a similar work had been identified -- and competition in terms of standard development is not allowed. Of course, prior to the proposal, the technical committee had checked for any concurrent development in the same domain, the answer was no concurrent development.
- From the end of the Sapporo meeting things have been blocked, the standardisation procedure of the Part has been be frozen.

The different stages of the Part 51 development process are represented on the time line below (Fig. 3) :

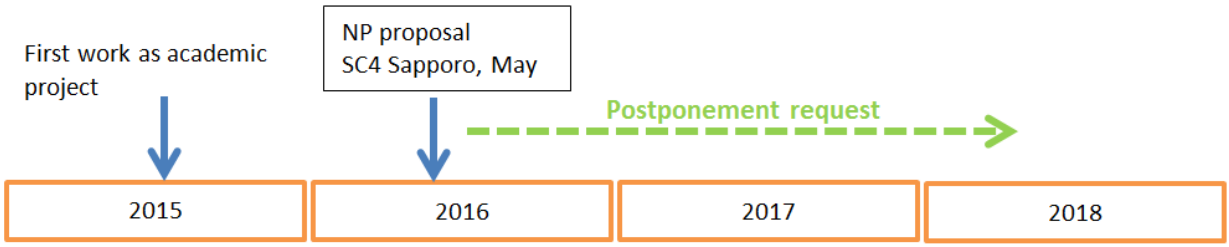

Fig. 3 : Time line for the proposal of ISO 15531-51 part

For this project of a future part 51, the development process was stopped at the NP stage, that is even before the first "real" standardisation stage : WD.

Hargrave and Van de Ven (2006) insisted upon the importance of framing the context ; a technological change introduces a rivaling new technology, and therefore, an institutional entrepreneur will compete to establish the legitimacy of its own technological trajectory in the public domain. In this particular case, the project suffered from the rivalry with IoT even though knowledge about IoT was not well disseminated at the beginning of the project on RFID tags. This induced uncertainty and reduced the global interest of setting a standard on RFID technology. Indeed, an explanation, provided by the convenor about the need for 3 different WDs for Part 44 : "*The development of this standard was almost straightforward, with 3 different WDs (working draft) : this was due to the fact that the implementation within the company was done in parallel with the development of the standard, whence the possibility for the standard under development to benefit from the most recent updates and corrections of bugs. Those technical modifications are still possible during the early stages of the standard development process (WD), but they are not allowed afterwards*." The convenor also explains : "*Fundamentally, this Part 44 is probably less innovative than a Part dealing with the information structuring of an RFID tag, since it relies on existing technologies, well known and used within industrial companies, even though the way of collecting and processing data in a shop floor through a unique and generic information model is rather new !"*

However, we observe that no explanations were given to explain the reasons for withdrawing the project whence the questions asked by the experts of the working group. In spite of the investigations, interviews with specialists, mails to question ISO chaiman, in order to get more information. No information were given, no precise answers, nor precise names of persons able to provide twith a more precise information about rival project – never really identified nor named. This lack of information drives us questioning the agency of institutional work. In the following lines, we analyze to which extent the institutional entrepreneur gain latitude or meet constrains and limitations to his project.

3.2 AGENCY IN INSTITUTIONAL WORK IN STANDARDIZATION

The institutional work done within standardization bodies relies on a formal and explicit process, requiring the conformity to rigourous rules, described in guidelines whose use is mandatory. This formal context influences the institutional entrepreneurship and work agency

through cultural, social-structural and socio-psychological contexts (Emirbayer et Mische, 1998).

3.2.1 Cultural, socio-psychological and socio-psychological contexts

Culture refers to symbolic patterns, social discourses and narratives : it enables or limits the understanding and the representation of the world and the possibilities offered within this world. Understanding ISO Directives requires a specific administrative and managerial culture. ISO Directives, although general and applying equally whatever the domains, require organizational capacities as well as a high motivation to go through all the steps of the process. The entrepreneur benefits from a technical and administrative assistance from the secretary, the chairman and the convenor but he has to describe the project in conformance with the ISO format and rules, notably for the initial document, written under the form of a New Work Item Proposal (NWIP), using the document called "Form 4".

Form 4 consists of a 6-pages document mentioning, among others, the title of the proposed deliverable, the purpose and the justification of the proposal, the name of the proposer and the proposed Project Leader, the Group within which the proposal will be developed, the type of deliverable (standard, technical specification, publicly available specification), the proposed development track, key milestones (dates), a list of relevant existing documents (if any), a list of relevant affected stakeholdders, categories and how they will each benefit from or be impacted by the proposed deliverable(s) and a list of relevant countries which are not already P-members of the committee is also needed. This NWIP document is fundamental, since it provides the initial (and mandatory) basis on which the standardization process will be launched. The previous version of the Form 4 was a 4-pages long document, far less detailed than this new version – and also less difficult to fill in. This new format requires institutional skills. It is probably also the most difficult step in the standardization process, since the following stages (working drafts, committee drafts, final drafts or technical specifications) can then be considered as logically flowing from the initial stage. If a decision is taken not to develop a new standard proposal, it generally happens during the initial stage.

Participating in the institutional work thus requires an important expertise, both for the technical

content and in terms of the "vocabulary and semantics" used in the standardization "world". The expression is really technical and the writing must be formal, the vocabulary requires expertise, the work demands a large investment in terms of time and motivation and the writing of the document must be scientific, argumentative, descriptive, which induces a scientific, efficient and clear approach and design of the project.

Emirbayer and Mische, (1998) also identified the socio structural context as enabler or constrain to agency. Social structures define interpersonal, interorganizational or transnational patterns of actions. They comprehend networks and social ties that constrain or enable actions. Social capital is required to gather a team of experts around a table to develop a new standard. It is one of the reasons why 5 countries are needed to write a new standard proposal. Weick (2011) observed that institutional entrepreneurship is often collective and that it requires "to mobilize resources, to mobilize other actors and to create meaning".

The institutional process requires the participation of at least five countries that agree to contribute to the standard shaping and to give name of experts . *"The process of proposing a NWI demands that at least 5 countries (nominating experts to contribute) are volunteers to work in the group to start the standardization process."* "*Most participants of JWG8 come from industry and commerce (stakeholder category as defined by ISO), Academics and research bodies, and NGO. Prior to their participation in the WG, they must be appointed by their NSB or by ISO TC 184 SC4 for the convener of the group. ISO is represented through the involvement of its TMB (Technical program manager). Industrials involved in the group are not competitors since they do not work on the same markets*." However as this committee has been working on different projects since more than twenty years, people know each other, which facilitates the work to be done and the working atmosphere. The personal relations installed between partners in standardization who have spent time to shape different standards in the same domain play an important role in the process. The convener will preferentially invite friendly experts in order to facilitate the standardization process. The working group gathers from 4 to 8 or 9 experts, depending on the session*." When a group starts to work on a new project, there is a form of cooperation between the members of the group… No strategies applicable to JWG8, the group is too small, and the experts involved …. understand each other very well, they are very friendly in between them".*

The third context influencing the agency is the socio-psychological context (Emirbayer and Mische, (1998). It concerns the ability of the entrepreneur. Actually, he has to feel legitimate to enter the standardization process. When interviewed, the entrepreneur said : "*I would say that the initial idea started from a project, provided by Schneider Electric, developed in close collaboration between the Engineering School (Ecole Centrale de Lille / IG2I) and Schneider Electric, spanning over 4 years. Given the results of the work done by the students and the involvement of the supervisors in standardization activities (both of them belonging to the ISO TC 184 SC4 committee, as expert or convener of the JWG8 working group), it seemed logical to propose the development of a new standard based on the results of the project"* Without this particular relation, the standardization process would probably have never been engaged *: "no, we would not have started*". Deciding to enter the standardization process also requires mobilizing resources and mobilizing other actors (Weick, 2011). "*It is true that common discussions, enrichments benefit from the differences in terms of approaches between the actors* "*In this case, the discussions were related to the benefits/drawbacks of standardizing the data carried on within a tag : what can/cannot be standardized, why, with which objectives ? and, if we standardize the data model of the tag, will this standard be used by other industrials ? This means : are we generic enough to put on the market a structure that fits the needs of other industrials ?"* Weick (2011) underlines the need of mobilizing resources. *"For an industrial company as important as Schneider Electric, this means a lot of time, a lot of persons dedicated to standardization (industrial and academics)".* However, the benefits are difficult to evaluate. *"Difficult to estimate the gains expected from standardization – probably important ! (industrial and academics)"*

3.2.2 From agency to strategy in standardization

Given the context of the current situation, we must raise awareness of the importance of seizing agency and taking a strategic approach to standardization.

First of all, lobbying from the beginning, so that the 5 countries required for proposing a new standard (NWI) - and the nominated experts – really participate in the workpackages (that is mandatory), really feel involved in the work to be done and vote Yes (or abstain) during the timescale of this work (minimum 2 years). Nonetheless this does not prevent imponderables

(parallel but undeclared developments - presented at the last minute), or indeed "betrayals". It is also important to note that, for some industrial companies (institutional entrepreneurs), the standardisation process is too long, for some others (or even the same ones) this process and the consensus that is required expose these companies, to some extent, to their competitors - hence the risk of being copied.

A pre- or co-standardisation work may be done within the structure of a consortium (there are numerous of these "orbiting" around ISO), sometimes in a closed or opaque manner. At the very last moment the consortium will "contribute" to the standardisation forum a well-constructed and complete document, in accordance with the presentation or environment sought for this particular integration (for example, for the IFC, use of the EXPRESS language and compliance with the approach of the ISO 10303 standard) qualifying for a so-called "fast-track" procedure which enables it, provided that the document is in compliance with the customary ISO guidelines, to be virtually signed-off as a standardisation document - PAS, or TS or even IS without going through the normal intermediate stages (WD, CD, DIS). This is the case specifically for the ISO 16739 IFC standard (https://www.iso.org/standard/51622.html).

OGC (Open Geospatial Consortium) operates in a similar manner in the field of geographic information. Whence a (strategic, and/or political) question : should consortia be granted a favourable treatment for preliminary fast developments, and thereby only present to the standardisation bodies those documents that have already achieved some kind of pre-consensus ? Or is it more "fair" to go through the entire (and formal, and time consuming) standardisation process, however undeterministic, or without any completion guarantee, it may be ?

Consortia, through the idea of grouping they propose to firms provide a good example of strategic behaviour. They also raise a question, that is : do both "tracks" (standardisation through SDOs or through consortia) obey the same rules, work under the same conditions ? Are the standards developed following the two tracks equivalent in terms of use, quality ? In terms of development time, generally speaking, consortia will probably need less time to develop "standards" than SDOs, but it is not a speed race. On the other hand, often enough, SDOs and consortia work independently, but sometimes also they can communicate with each other, taking into account that some of their experts are "mixed" - i.e belong to both organisations, without necessarily openly declaring this situation.

Most standardisation projects find their origin in industrial, technical or business needs expressed by firms. However, the study presented in this paper also shows that this origin is not necessarily sufficient to guarantee the success of the standardisation process. Drafting a standard, developing a standard is an institutional work, firms need to be trained to this approach, they need to integrate the importance of strategic based approaches necessary to carry out the standard development project.

Discussion[A4]

These observations lead us discussing some questions concerning the entrepreneur agency. They first confirm Wieck (2011)'s recommendations : The objective of creating an institution requires mobilizing resources, mobilizing others and creating meaning. First, standardization requires financial resources. Participating into a technical committee requires an adhesion to the standardization organization. The different costs relating to the time spent on meetings, the work achieved to write a project, the proposal, to add comments, the vote, the travels to go to the meetings are representing costs that not all companies, especially the small and medium size enterprises, can afford. This is in line with literature (Battilana 2006; Beckert 1999; Garud, Hardy and Maguire 2007; Khan, Munir and Willmott 2007; Levy and Scully 2007; Misangyi, Weaver and Elms 2008; Mutch 2007; Zilber 2007) and the case of standardization offers an empirical context enabling to specifically measure the related costs. Secondly, standardization demands to mobilise other actors which also confirms Weick (2011)'s recommendations but also litterature's observations (Beckert 1999; Fligstein 2001; Garud, Hardy and Maguire 2007; Khan, Munir and Willmott 2007; Levy and Scully 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Suddaby and Greenwood 2005; Wijen and Ansari 2007; Zilber 2002). The mobilisation of others also draws on Fligstein's (2001:106) definition of socially skilled actors: "The ability on the part of actors to analyze and attain such cooperation can be viewed generically as social skill". The case analysis showed how the entrepreneur came into the process because he knew the person in charge of the technical committee. He was confident that the difficulties would be carried on by the technical committee composed of experts. Would he had triggered this process if he was alone ? He was asked the question and answered "maybe not". However, Schneider Electric is systematically represented in standardization as a legitimate actor on numerous industrial fields. We observed that the convenor's social capital

and the very tied knowledge of the experts gathered in the committee played a part very important in the management of the project. The confidence established between the members constitutes a facilitator to the process. This confidence is not sufficient. In this case, the ISO TC Chairman would not permit the pursuit of the project. From the one hand, this shows that a committee cannot obtain the standards they want which would signify a total power in the hands of experts. On the other hand, it is very surprising that no explanation would be given to this stop. Here, the agency of the TC chairman gives him the freedom to univocally decide with no accountability of his decision. In this perspective standardization is not the transparent formal consensual process it is supposed to be.

The third recommendation by Weick (2011) is the idea that entrepreneurs create meaning (Garud, Jain and Kumaraswamy 2002; Misangyi, Weaver and Elms 2008; Perkmann and Spicer 2007; Rao and Giorgi 2006; Suddaby and Greenwood 2005; Zilber 2007), which is derived from Zilber's (2002) work on the role of meaning in institutional agency. The case analysis showed how the procedure demands clarification of the objective, the stakeholders, the consequences which permits to expose the real meaning of the project, what are its advantages, who are concerned, what would it be useful for. Here again, the case of standardization gives an illustration of institutional work literature. Technical standards belong to a technical domain, but they are based on underneath values. The standardization process contributes to make explicit the values on which the technical standard is based.

Finally, this case enables to bring a contribution to the debate between institutional entrepreneurship and institutional work. As we have already observed, standardization requires an institutional work because it is necessarily collective. However, we can focus on specific roles within the committee and we can observe more specifically how the representative of a firm, who is not a standardization expert, integrates the formal standardization process and how his project may evolve through collaboration and institutional process. Yami et al (2015) have observed the actions undertaken by Microsoft in the technical committee and how he could manoeuvered to sponsor its project. Nevertheless, the project itself evolved sensibly through the process. For this reason, the standardization process constitutes an interesting domain composed of institutional pressures and agency that require to be enlightened for firms and experts to better manage their institutional work.

Conclusion

The analysis of agency in the standardization process showed some limits due to cultural, socio-structural and psycho-social context. We then exposed how strategy is required to prepare the development of a project. It is indispensable to enact a collaborative network, to facilitate institutional arrangements, to enact the political and collective process. To some extent, a question might be asked to the institution : how do they facilitate the entrepreneur agency ? Through the examples analysed and compared in this paper, we have here a typical case of a rapidly evolving technology, thus needing a quick adaptation of the focus of standardisation. Finally, standards become more and more complex, the domain(s) they cover is (are) sometimes not easy to identify, some of them can be related to several themes and the same vision applies to innovation : often wide, not easy to put into a specific category.

In this context the standardisation process can prove to be difficult, not always clear nor transparent. The two standards projects were based on a similar industrial motivation and answered user needs. However, in one case the process arrives at an end-result ; in the other case the process is interrupted without any clearly-defined reason. This can be considered as a waste of (valuable) resources. Is standardisation, despite of all its efforts, an unclear process for the actors engaged in it or a sort of "black box"?

The challenge therefore for an institution such as an SDO is to call for the participation of firms whilst avoiding the risk of uncertain outcomes. This raises some questions :
- is it still worth trying to standardise something whose usage (or even existence) could be modified due to the arrival of a new or an emerging technology (emerging more or less at the same time), very close in its scope and application domain ? – This aspect can become particularly crucial in the domain of information technology where techniques, technologies, or else tools may be superseded very quickly. Standardization in this domain must pay a great attention to this point.
- Is the necessary consensus usually met in standardisation possible between competitors offering concurrent products at the same time ?

The mandatory deadlines met during the standardisation process take time. Maybe the RFID tags standardisation project could have benefitted from disclosure agreements. Whence the

question : is there a competition between innovation and standardisation ? Or, in other words, are innovation and standardisation compatible, as processes targeting products, since innovation is a fully competitive approach, possibly between industrial competitors once the product is put on the market ; standardisation forces the companies involved in the domain of a potential new standard to sit around the same table ; standards development organisations (SDOs) may also behave as competitors when a new standard proposal is at the border of the domains they cover. The same considerations apply to TC (Technical committees), when a new proposal can be seen from different points of view.

This is a first publication addressing the problem statement evoked above. Clearly there is more work and research to be done in order to deal with these issues.

Annex

The standardisation process : statutory rules and importance of time

All the work leading to the development of a new International Standard is fully documented according to a set of specific and legal rules, described in ISO Directives[1]. The primary duty of a technical committee or subcommittee is the development and maintenance of International Standards. However, committees are also strongly encouraged to consider publication of intermediate deliverables as described in Clause 3 of ISO/IEC Directives Part 1 (TS and PAS).

International Standards shall be developed on the basis of a project approach as described below.

In this situation, the submitter has to explain his project and justify that a standard is required through a business plan. The Annex numbered SC of the ISO/IEC Directives Part 1 describes the objectives of strategic business plans, and the procedure that applies to their development and approval. Each technical committee shall prepare a strategic business plan for its own specific field of activity,

a) taking into account the business environment in which it is developing its work programme;

b) indicating those areas of the work program which are expanding, those which have been completed, and those nearing completion or in steady progress, and those which have not progressed and should be deleted;

c) evaluating revision work needed (see also the respective Supplements to the ISO/IEC Directives);

d) giving a prospective view on emerging needs.

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[1] - ISO/IEC Directives, Part 1, Procedures for the technical work, 13th edition, 2017

- ISO/IEC Directives, Part 1, Consolidated ISO Supplement – Procedures specific to ISO, 8th edition, 2017

- ISO/IEC Directives, Part 2, Principles and rules for the structure and drafting of ISO and IEC documents, 7th edition, 2016

Unless otherwise mentioned, all references of the section below come from ISO/IEC Directives, Part 1, Consolidated ISO Supplement – Procedures specific to ISO, 8th edition, 2017.

The strategic business plan shall be formally agreed upon by the technical committee and be included in its report for review and approval by the technical management board on a regular basis.

Table B.1 below shows the sequence of project stages through which the technical work is developed, and gives the name of the document associated with each project stage.

The development of Technical Specifications, Technical Reports and Publicly Available Specifications is described in Clause 3 of ISO/IEC Directives Part 1 (TS and PAS).

Table B.1 — Project stages and associated documents

Project stage	Associated document	
	Name	Abbreviation
Preliminary stage	Preliminary work item	PWI
Proposal stage	New work item proposal a	NP
Preparatory stage	Working draft(s) a	WD
Committee stage	Committee draft(s) a	CD
Enquiry stage	Enquiry draft b	ISO/DIS IEC/CDV
Approval stage	final draft International Standard c	FDIS
Publication stage	International Standard	ISO, IEC or ISO/IEC

a These stages may be omitted.
b Draft International Standard in ISO, committee draft for vote in IEC.
c May be omitted.

This Table illustrates the steps leading to publication of an International Standard.

The ISO and IEC Supplements to the ISO/IEC Directives give a matrix presentation of the project stages, with a numerical designation of associated sub-stages : see the Fig. 4 below :

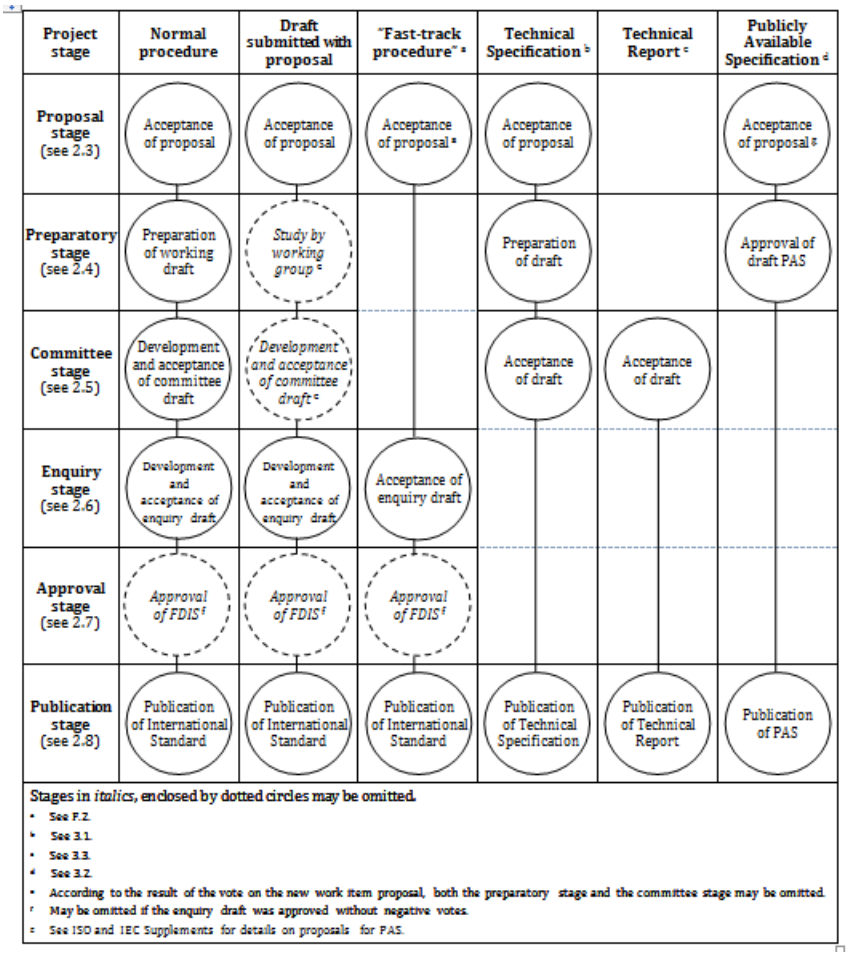

Fig.4 : Simplified diagram of options

To facilitate the monitoring of project development, ISO has adopted a systematic approach to project management, based on subdivision of projects into stages and substages.

- **Project description and acceptance :** A project is any work intended to lead to the issue of a new, amended or revised International Standard. A project may subsequently be subdivided.

- **Program of work:** The program of work of a technical committee or subcommittee comprises all projects allocated to that technical committee or subcommittee, including maintenance of published standards. The program of work shall indicate, if appropriate, the subcommittee and/or working group to which each project is allocated.

- **Target dates:** The technical committee or subcommittee shall establish, for each project on its program of work, target dates for the completion of each of the following steps:

- completion of the first working draft (in the event that only an outline of a working document

has been provided by the proposer of the new work item proposal);

- circulation of the first committee draft;

- circulation of the enquiry draft;

- circulation of the final draft International Standard (in agreement with the office of the CEO);

- publication of the International Standard (in agreement with the office of the CEO).

These target dates shall correspond to the shortest possible development times to produce International Standards rapidly and shall be reported to the office of the CEO, which distributes the information to all national bodies. The technical management board will cancel all work items which have been on the work programme for more than 5 years and have not reached the approval stage.

- **The strategic question of time :** When a proposed new project is approved (whether for a new deliverable or for the revision of an existing deliverable), when submitting the results to the ISO Central Secretariat the committee secretariat shall also indicate the selected standards development track, as follows (all target dates are calculated from the date of adoption as an approved project :

- Accelerated standards development track — 24 months to publication

- Default standards development track — 36 months to publication

- Enlarged standards development track — 48 months to publication

The target dates shall be kept under continuous review by committee secretariats which shall ensure that they are reviewed and either confirmed or revised at each committee meeting. Such reviews shall also seek to confirm that projects are still market relevant and in cases in which they are found to be no longer required, or if the likely completion date is going to be too late, thus causing market players to adopt an alternative solution, the projects shall be cancelled.

According to the type of track (accelerated, default, enlarged), the different stages of the development process can be represented on the following schema : Fig. 5 below :

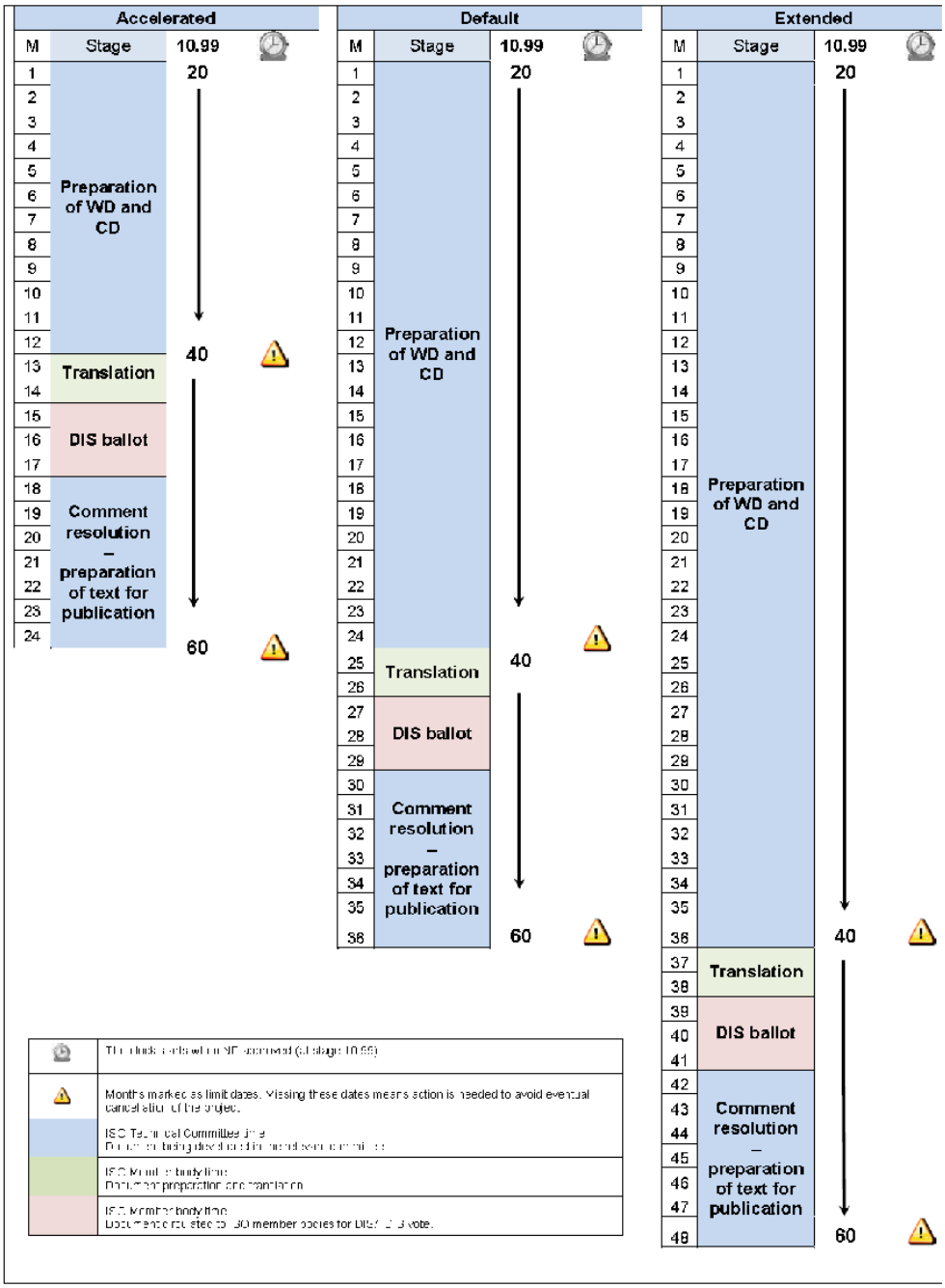

Fig. 5 : Target date planner (from Getting Started Chairs, ISO, 2014)

- **Project management :** The secretariat of the technical committee or subcommittee is responsible for the management of all projects in the program of work of that technical committee or subcommittee, including monitoring of their progress against the agreed target dates.

If target dates are not met and there is insufficient support for the work (that is, the acceptance requirements for new work are no longer met), the committee responsible shall cancel the work

item.

- Project leader : For the development of each project, a project leader (the WG convenor, a designated expert or, if appropriate, the secretary) shall be appointed by the technical committee or subcommittee, taking into account the project leader nomination made by the proposer of the new work item proposal. It shall be ascertained that the project leader will have access to appropriate resources for carrying out the development work. The project leader shall act in a purely international capacity, divesting him- or herself of a national point of view. The project leader should be prepared to act as a consultant, when required, regarding technical matters arising at the proposal stage through to the publication stage.

- Progress control : Periodical progress reports to the Technical committee shall be made by its subcommittees and working groups (see also ISO and IEC Supplements to the ISO/IEC Directives). Meetings between their secretariats will assist in controlling the progress.

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