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Study of PASTEL User's Behaviour During the Declaration Process, Illustration of How a Web Portal Dedicated to the French Additional Protocol Improves Safeguards.

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The Additional Protocol to the Safeguards Agreement between France, the European Atomic Energy Community (EURATOM) and the IAEA aims to further enhance nuclear non-proliferation by strengthening the effectiveness and improving the efficiency of the Agency's safeguards system. Indeed, IAEA has to verify the non-diversion of nuclear material and the absence of undeclared activities, with Non-Nuclear Weapons States (NNWS). Hence, France declares activities with NNWS such as research and development, teaching in higher education or fuel cycle equipment manufacturing. In 2014, the French Institute for Radiological Protection and Nuclear Safety (IRSN), which is the French technical support organisation (TSO), decided to develop a web portal dedicated to the Additional Protocol declaration called PASTEL. Its purpose is to gain in efficiency and enhance this declaration. This portal is used since 2015 and is continuously improved. Understanding the issues related to the user's behaviour during the statement allows ensuring the completeness and correctness of the declaration and increases the declaration's efficiency. Therefore, this paper quantifies and evaluates the time spent on the web portal by registrants and IRSN analysts. For both, PASTEL saves a lot of time, showing the benefits of deploying a web portal for this declaration. This time saved by IRSN analysts is now used for the open source investigation to enhance the completeness of the French Additional protocol declaration. In the future, the purpose is to ease the declaration process and to consider the development of an automatic method based on open source mining.

Keywords: Additional Protocol, Declaration, International Safeguards, IT Tool, Non-Proliferation, Web Portal.

INTRODUCTION

The International Atomic Energy Agency (IAEA) ensures the peaceful use of the atom. One of its missions is to verify the non-diversion of nuclear material and the deficit of undeclared nuclear activities [1]. In order to support the IAEA's mandates, the additional protocol (AP) [2] to the French safeguards agreement [3] has entered into force on 30 April 2004. The French additional protocol provides for the declaration of activities, such as research and development, higher education or fuel cycle equipment manufacturing, undertaken by French entities with Non-Nuclear Weapons States (NNWS).

As part of the mission entrusted to it by the Euratom Technical Committee (CTE), the Non-Proliferation and Nuclear Material Accountancy Department of the French Institute for Radiological Protection and Nuclear Safety (IRSN) prepares the declarations of the French AP. To increase efficiency and enhance this declaration, IRSN developed in 2014 a web portal called PASTEL [4] that follows the French strategy for generating these statements. France has been using this portal for five years and continues to improve it, in order to make its declarations as exhaustive as possible.

Each year, IRSN contacts directly all declarants registered into PASTEL. They have been added to PASTEL database previously by IRSN analysts, on the basis of census or of declarations of other registrants declaring activities with them. Then, declarants assert their reportable activities in PASTEL and have two choices. They can select between a positive statement, if they have activities concerning the AP or a negative one if they do not. Only the positive declarations are reported to the Agency. Negative ones allow us to monitor entities that may occasionally have activities covered by the AP. Continuing to contact these entities is an important point for the French registration strategy. To illustrate this, when the web portal PASTEL was first open for the 2015 annual declaration (AD), 4% of registrants who answered positively did not in the previous period [5]. Then, IRSN analysts gather data collected and draft the French declaration. PASTEL generates Excel, PR files which are validated by CTE and the ministries, before being sent to the IAEA.

As far as we know, very little work has investigated user's practice on AP declaration portals. However, understanding how registrants made their statement is a matter of interest both for states that want to ensure the completeness and correctness of their declaration, and for the registrants themselves, for whom the additional protocol criterion may seem unclear [6].

The aim of this work is to quantify the time spent for this declaration on the web portal PASTEL and also to evaluate declarative habits. The digitalisation effects on declarants' behaviour over five years have been investigated. It has significant advantages in terms of safeguards because the time saved and the gain in efficiency for this declaration allow to improve its completeness and correctness. It is therefore of interest to analyse the impact in the field of the AP implementation. [7].

1. METHODOLOGY

The data used in this work comes from two sources: one consists of testimonials, the other one is statistics collected by PASTEL.

This study examines data obtained from five years of additional protocol reporting. There are two profiles of users: IRSN analysts and declarants. Each user is assessed according to his profile. They were more than 200 declarants and 5 IRSN analysts in this sample. Three periods are considered: before 2015, between 2016 and 2018, after 2018:

- Before 2015, only feedback from IRSN was collected. Analysts were interviewed to estimate the time spent. At that time, the record was established through Excels tables. Most of the IRSN's effort consisted of data entry and support for the declarants. No work was carried out on the registrant's behaviour.
- Between 2016 and 2018, the declaration was made on the newly created web portal PASTEL. In 2017, and for the first time, a survey was conducted among users to collect their feedback, 20% of them responded. The sample of declarants was composed of different sizes of entities. This information enabled us to improve our IT tool, accelerate the statement process and make it more secure. At the same time, feedback from IRSN analysts was provided allowing us to quantify time spent on the declaration and differentiate tasks related to AP. Since 2016, with the digitalisation process, the work of IRSN analysts has changed and activities have been added. They have to work on the portal to gather the registrant's declarations and support them. They also look for new research programs and find entities through open-source validation [8], verify the localisation declared by the declarants and care for PASTEL's development and maintenance [5].
- After 2018, a PASTEL's update allowed to quantify the duration and the number of connections in the portal for all users, registrants and IRSN analysts. These data are collected once a year when the declarations are archived. The work of IRSN analyst is similar to the previous period between 2016 and 2018. Between 2020 and 2021, PASTEL was upgraded with an automatic call for declaration by email. Other features were added to reinforce the quality of the French declaration. From now on, PASTEL requires registrants to update their contact details, in accordance with the General Data Protection Regulation, and to justify their negative registration [5].

2. RESULTS AND DISCUSSION

2.1. IRSN analysts

Previously to this study, IRSN showed that the setting up of a web portal saved a significant amount of time, about 120 person-days [5]. These results were qualitative and contained high uncertainties. In 2019, PASTEL was upgraded with a system that quantifies the time spent on the portal. This allows examining the behaviour of IRSN analysts and comparing this data collected on the portal with testimonies gathered in previous years.

According to the French Labour Code, the daily working time is 8 hours [9]. As the duration of connection given by PASTEL is a total, the actual working time was converted. In other words, 8

hours of connection to the portal corresponds to one person day of work on PASTEL. This time is quantified in “person-days”.

To examine the impact of the time spent on PASTEL, this study focused on the annual reporting period, i.e. between December and April, for the last three years. This five-month period does not take into account the time spend by IRSN analysts during the rest of the year. After the declaration period, IRSN analysts have others AD-related activities. For example, since 2019, between June and September one of the activities consists in examining the requests for deletion from the list of declarants. Indeed, if declarants do not have anymore additional protocol activities, they can request to be removed from the list. IRSN analysts check the legitimacy of their request and improve the efficiency of the French declaration.

The table 1 presents the evolution of the working time of IRSN analysts on activities related to the additional protocol. The working time measured by the portal during the last three years of the declaration was compared with the estimated working time evaluated between 2016 and 2018. It indicates a range from 21 to 32 person-days per year on PASTEL. IRSN analysts remain in charge of activities outside the portal. These activities constitute an equivalent proportion requiring between 20 and 40 person-days. This result ties well with previous studies wherein it was shown that additional protocol declaration needs 60 person-days [5]. The time saved by the implementation of PASTEL is now confirmed by quantitative data measured by the portal.

Moreover, the working time on the portal over the last three years shows a decrease in 2020 and a rise in 2021. Nevertheless, the number of declared programs is almost constant over this period. Besides, the periods 2019 and 2020 correspond to the arrivals of new IRSN analysts. So there is a correlation between the variation in working time on the portal and the arrival of new IRSN analysts. This results cast a new light on the training time required for a new analyst in additional protocol activities. On average, an increase of five person-days at each new arrival was estimated. If the use of the tool is quite simple and intuitive, the analysis of the additional protocol declarations in real cases requires learning time, acquired only by experience.

Table 1. Evolution of the working time of IRSN analysts on activities relating to the additional protocol

	Before 2015 [5]	Between 2016 and 2018 [5]	2019 (AD 2018)	2020 (AD 2019)	2021 (AD 2020)
Duration of connection to the portal (in working time)	Not applicable	27 person-days*	27 person-days	21 person-days	32 person-days
Working time outside the portal	180 person-days*	60 person-days*	20-40 person-days*		

**Estimated data based on testimonies*

2.2.Registrants

Over this period of 5 years, understanding the behaviour of the declarants has enabled us to improve the tool and to propose changes to save time and gain in efficiency. The following is focused on the quantification of the time saved or lost on the portal as well as on the behaviour of registrants during the reporting period.

Time spent on the web portal by declarants between 2019 and 2021

The time spend by declarants on PASTEL for the period 2019 to 2021 was quantified by the software. The bar chart below (figure 1) shows the distribution of registrants according to three categories:

- The ones that spent more time on the portal from one year to another are reported under the category “loss of time”
- The ones that spent less time on the portal from one year to another are reported under the category “gain in time”
- The ones that spent equal time from one year to another are reported under the category “unchanged”

This distribution is displayed for three consecutive declarations.

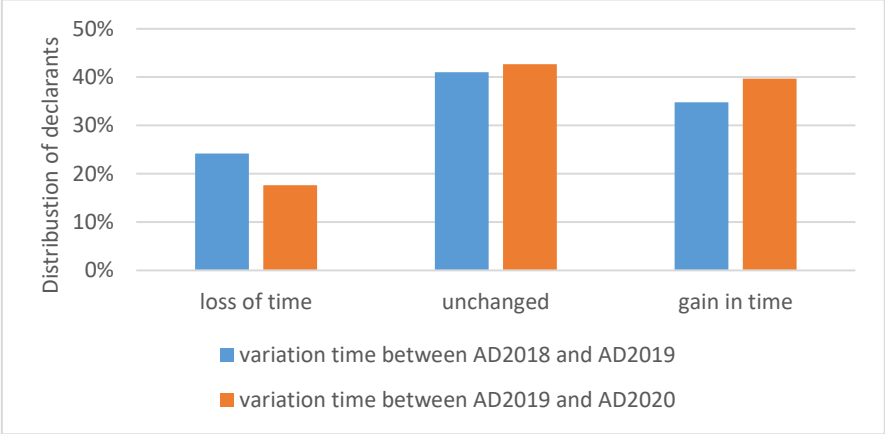


Figure 1. Distribution of registrants according to time spent on the portal from one year to another

On average, more than a third of declarants saved time compared to the previous year when completing their declaration (around 40 minutes). Besides, the proportion of declarants reporting saving time is increasing. Moreover, the number of declarants that lost time in 2020 compared to 2019 decreased significantly from 24% to 18%, and this lost time decreased from one hour to 17 minutes. Some entities welcome newcomers that are not used to AP declaration and to PASTEL and that can explain for some part why declarants can spend more time on the portal than the year before. Just over 40% of respondents spent the same amount of time from year to year on the portal.

As highlighted qualitatively by our previous study and quantitatively here, PASTEL allows an important gain of time for declarants in the preparation of their declarations.

Table 2 shows that the negative declaration rate is stable (around 60%). These negative declaration are faster to declare than positive declaration. The time saved can therefore be attributed to a gain in efficiency for the positive statements.

Table 2. Repartition of declaration types according to the annual declaration (AD) over a three year period

	AD 2018	AD 2019	AD 2020
Positive declaration	37%	42%	43%
Negative declaration	63%	58%	57%

The number of connections for each declarants was also investigated (figure 2). We observed that, from AD2018 to AD2020, there was an increase from 10 to 30 % of declarants that complete their declaration in a single connection.

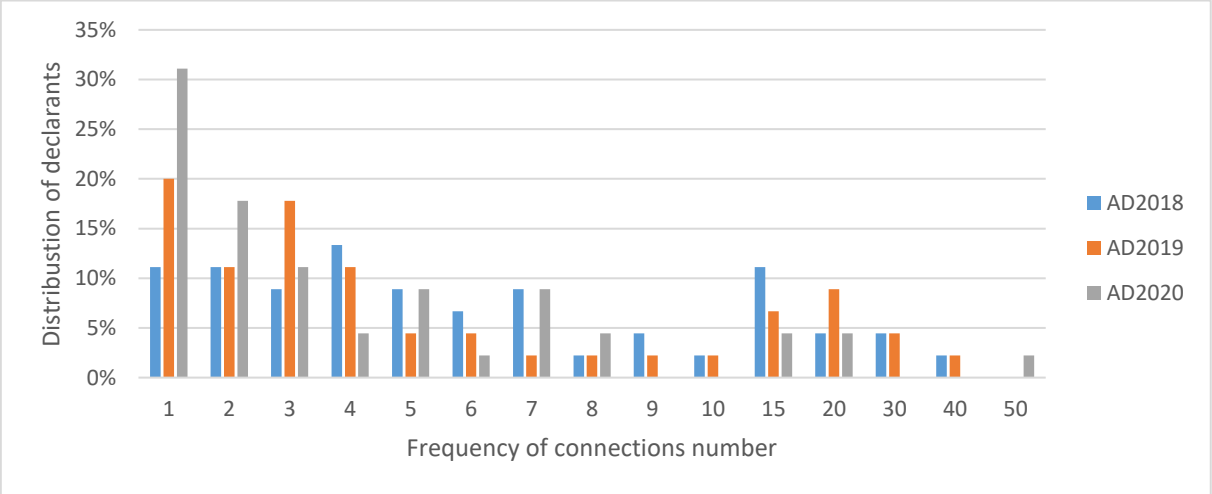


Figure 2. Distribution of number of connections over the annual declaration period

Another observation is that in 2020, there are fewer declarants that connect more than 10 times than in 2019 and 2018. This shows a greater efficiency in carrying out their declarations.

As highlighted qualitatively by our previous studies and quantitatively here with data presented on figures 1 and 2 and given that the number of programs remains stable for the last three years, PASTEL allows an important gain of time for declarants in the preparation of their declarations.

We were also interested in looking for a correlation between the number of lines declared on PASTEL and the time spent on this portal. The figure 3 investigates this issue, presenting the average number of lines and time spent by registrants, both over a three-year period. The horizontal axis indicates a sample of 41 entities, ranked in ascending order of lines number.

We observed that, entities that declare few lines spend variable time on their declaration (from few minutes up to few hours by line). This can be explained by the need to enter new data (new participant addresses for example) regarding their new programs. It sometimes corresponds to intense period of call for projects such as for example European Commission funding program H2020. Entities that declare lots of line are more comfortable with the IT tool and the AP declaration and spend less time per line (around 5 minutes by line).The data revealed an average time to state one line of about 15 minutes.

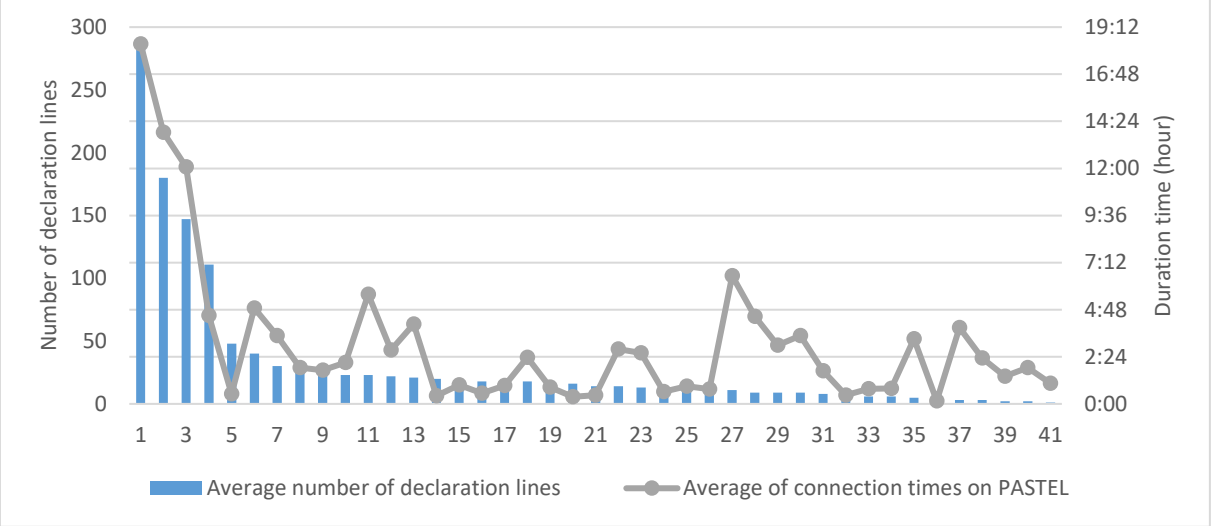


Figure 3. Correlation between the numbers of the lines declared under the 2ai article and the connection time by registrants, both for the last three years.

Finally, as already mentioned in our previous work, the people in charge of declarations for the entities change very frequently (approximately every two years according to their feedback), and they have to discover and own the tool again. For this purpose, IRSN organise training every two years to help newcomers. This has probably an impact on the time spent on the portal that cannot be evaluated.

2.3.Registrant behaviour

Each year, the IRSN analysts open the web portal during a defined period to allow declarants to fulfil their declaration. Previously, the portal was open in early December. The data in Figure 4 shows that only few declarants make their statement in December, at the beginning of the declaration period. This analysis led us to adjust the opening period of the portal.

Thus, since 2021, the opening of the portal is early January[i]. Following this, a slight postponement to February has been observed. It is important to point out that the portal is normally closed at the end of February. However, IRSN allows an extra month for declarants to submit their statement. The Data indicates that 16% of them finalise their declarations in March. Most of them have a large number of lines, which could be an explanation of the delay observed.

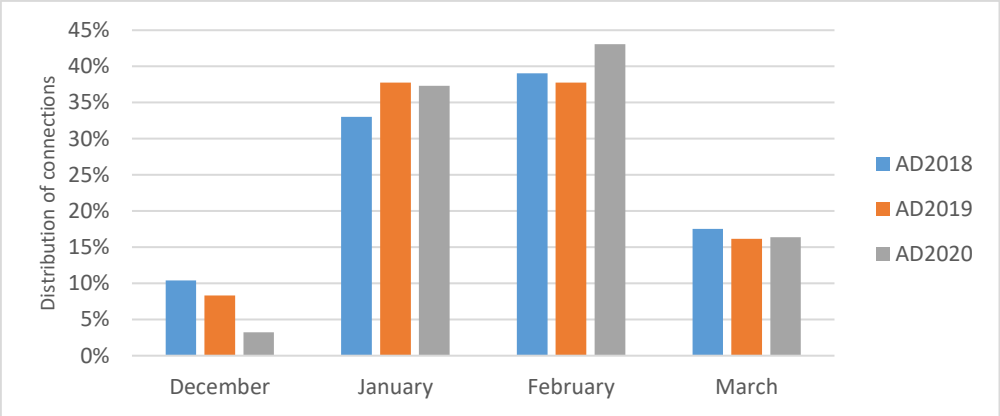


Figure 4. Distribution of connections over the annual reporting period.

In addition we were also interested in assessing the nature of registrants' requests. By comparing the behaviour of declarants for the period 2016-2018 and after 2018, a change of their needs was observed. Indeed, at the time of the setup of PASTEL, the questions were more oriented on the portal whereas afterwards, they became more technical. Declarants are getting used to the portal and are now more focused on details of their declaration.

CONCLUSIONS

The study shows that PASTEL web portal saves significant time for IRSN analysts. The time spent by analysts on the web portal that was estimated for the period 2016-2018 is now confirmed by the values recorded by the portal for the period 2018-present. Many activities related to the additional protocol, achieved thanks to this time saving, are not taken into account by the automated measured count of the portal, but ensure the quality and completeness of this declaration.

When analysing the time recorded for the analysts on the portal, the training duration of newcomers has to be taken into account. While getting to know the tool does not seem complicated, understanding and implementing the AP declaration requires a longer adaptation time. Additionally, support for registrants is an important part of the analysts' work. Indeed, there is lot of uncertainties about the information to be declared and stakeholders who are familiar with technical fields are not necessarily familiar with AP reporting requirements and therefore need the assistance of IRSN analysts.

This study also shows that for registrants, PASTEL allows an important gain of time. Data highlight that over the years, they spent less time on the portal and are more efficient.

As previously reported in the literature by L. Rockwood [7], three challenges among others stand out, in connection with AP implementation:

- "identifying the relevant stakeholders" ;
- "uncertainty about what was required to be declared" ;
- "difficulties in using the related reporting software."

Thus,

- the highlighted gain of time for IRSN analysts allows them to focus on other tasks, and that responds to the first challenge
- the highlighted gain of time for registrants solves the third challenge and allows them to be more focused on the content of their declaration, and that responds to the second challenge.

In addition, as part of a quality approach, the declaration process will be implemented with new features, in order to continue along this path. For this reason, in future work, we will try to enable better efficiency and to reduce the time spent by declarants on the portal. To this end, two PASTELS' evolutions could be considered. The first one would be to automate the carry-over of declarations under the article 2.a.(viii) (planned R&D activities) to declaration under 2.a.(i) (ongoing R&D activities) when the R&D programs start, of the French AP. The second one would be to create a new interface into PASTEL to add new programs identified by IRSN analysts thanks to information sources such as CORDIS (Community Research and Development Information Service), OECD/ NEA, etc.

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[i] Data of December 2020 on figure 4 corresponds to 4th quarter declaration and not to annual declaration