Workflow Specification for Enterprise Localisation

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Abstract

Localisation concerns the translation of digital content and software, and their appropriate presentation to end users in different locales. Localisation is important because having software, a website or other content in several languages, and meeting several sets of cultural expectations is an important international marketing advantage. In the non-commercial sector, where information equality is deemed important, localisation also enables information access for minor languages as Galician. These requirements have led to increased localisation activities and act as a prompt to study how the localisation process can be optimised. A necessary pre-requisite for this, is a standardised localisation process. Such a standard process not only provides a basis for continuous quality improvement (CQI), but also has the potential to direct further research in the area.

In terms of representing and enabling this standard localisation process, workflow technology provides an interesting solution. Workflows are concerned with formalising task structure: the order of subtask invocation, synchronisation and flow of information through the tasks, the roles of people that perform the tasks and the tracking and reporting of tasks. Since the 1970s, workflow technology has expanded into fields like manufacturing and accounting and now is reaching the localisation industry.

A generic localisation process definition in workflow form would allow companies standard process guidance when faced with localisation tasks, and would provide researchers with a framework within which they can contextualise their research and identify new research challenges. The potential automation offered by workflow engines provides the potential of real efficiency gains for companies.

This paper describes research towards the representation framework of enterprise localization workflows. We document several important localisation-process issues identified in the relevant literature. We will also evaluate existing workflow languages as a means of representing such localisation processes at a later stage.

Keywords: *enterprise localisation, standards, workflow, workflow languages*

1. Introduction

Localisation has developed into a multi-billion dollar professional industry during the last decades. Companies have increasingly sought international markets to sell their products

and localisation has proven to be a key to this endeavour (Esselink 2000). Generally speaking, localisation is the translation and adaptation of software, websites and all related digital content such as documentation for specific locales (Esselink 2000). A typical localisation project would include the full translation, engineering (e.g. linguistic and functional testing of the localised software application) of a system, its online help and its documentation, printed and/or digital. As such, translation is a core component of the localisation process. Related activities in localisation projects are terminology management, editing, proofreading, page layout, engineering of files, and testing.

Nowadays, we have an increasing amount of web-based applications, and database-driven websites that need localisation into multiple locales and this has resulted in a considerable rise in the volume of content to be localised. Hence, new approaches need to be found to cope with this increasing volume while maintaining and improving quality.

This paper will concern itself with the enterprise localisation context (section 2). More precisely, we focus on localisation issues (section 3) relevant to workflow management in enterprises; issues such as automation, linguistic resources, quality and recognition of the importance of personnel. In this context a workflow is defined as "a computerised facilitation or automation of a business process, in whole or part" (Hollingsworth 1995). Workflow management systems define, manage and execute these workflows using a software application (Hollingsworth 1995). Thus, defining this process as a workflow would enable potential automation and efficiency of the process, and this paper is a first step towards that definition.

In addition, the paper will examine the most suitable workflow languages for representing this localisation process as a workflow (section 4). It refers to a classification of workflow languages according to resources, data sets and functions, while section 5 is related to expectation of workflow management tools. In section 6, we summarise some challenges of the current processes and present a high level enterprise localization process that will act as a framework for exploration of more detailed enterprise localization workflows.

2. The Enterprise Context for Localisation

Localisation occurs in many contexts: profit and non-profit. For example, voluntary organisations are often interested in localising information content on websites to provide medical health information to third-world locales (e.g. Medicines sans Frontiers). However, this paper concerns itself with enterprise localisation, where localisation is performed by a commercial organisation, typically for market gain. Consequently, we define what we mean by an enterprise. An *enterprise* as largely defined by a sense of large scale or at least scalability (Sikes 2009, p.16). Texin (2002/12: 15) defines several attributes of companies who localize large volumes:

i) Strong belief in ultimate product success;
ii) Millions of units sold;
iii) Recall is significant cost;
iv) Recall can kill a product’s market;

v) Large QA staff and thorough QA process;
vi) Large beta test, lots of value-added reseller (VAR) interest;
vii) Single source is imperative;
viii) Coding standards for developers in place, including internationalisation;
ix) Chief executive officer (CEO) knows international impacts bottom line.

3. Issues in Localisation

There are many important issues in localisation which need particular attention. In the following paragraphs we discuss 3 such issues: automation, linguistic resources, and recognition of localisers.

3.1 Automation

Today, efficiency and thus automation, is a core concern for localisation. The so-called Translation Environment Tools (TEnTs) automate the translation process and Zetzsche (2009, p.200) presents the features which every TEnT tool should have:

i) resource (such as translation memory) lookup;
ii) terminology management;
iii) project management;
iv) word counts;
v) software localisation.

Sophisticated TEnT tools like memoQ from Kilgray also offer a complete translation workflow online via features such as document online storage and the ability to work online on a project together with other translators and people within the translation workflow (for example reviewers and terminologists). This kind of technology allows several people to work on the same project simultaneously. Data is also stored online and cannot get lost in a local computer crash. However, it should be noted that while these tools to create workflows exist, standard, state-of-the-art workflows do not seem to exist and consequently, companies are left to their own devices to recreate best practices in this regard.

3.2 Linguistic Resources

Linguistic resources are generally important to accelerate and facilitate the localisation process. In this subsection we refer to three different linguistic resources: translation memories (TMs), machine translation (MT) systems, and terminology databases.

With the adoption of web technologies in localisation, TMs can be accessed online from anywhere in the world and newly evolved exchange standards such as TMX allow data exchange between different computer-assisted translation (CAT) tools. Hence the advantages of TMs can be leveraged across companies, geographical locations and different platforms.

With the gain that TM implies, comes an associated need to maintain such linguistic resources. Dalmau (2009) states that TM quality always depends on the reliability of human translators. Errors that are not spotted will be recycled and made again and again.

Therefore, the person responsible for the TM should perform maintenance to ensure high quality content as well as feedback to the end client (e.g. regarding terminology, style, etc). While this seems to be a lesser issue when done in-house, when localisation is being outsourced to localisation service providers (LSPs) and other contractors, it is more typical that the issue seems to snowball.

As for MT, its quality has improved over the years. Among many authors, Yunker (2008, pp.30–31) says that many companies now use statistical MT (SMT) in the first part of their translation workflows. SMT predicts how a sentence should be translated based on algorithms, and it learns from its "mistakes". SMT gets better when translations are fed to the system and the more closely aligned the engine is with the specific industry or application. Noteworthy here is that MT has high quality output for certain text types. For example, it is not suitable for legal or marketing texts, but it is suitable for text with high repetitions and controlled language use, such as technical documentation (Sonstenes 2009).

Another important linguistic resource is that of term bases and the associated activity of terminology management. Terminology management is the process of formalising the terms used within a company. According the localisation company Lionbridge, terminology management aims to identify, capture, and deploy this unique terminology, and to do so localisers have to:

i) determine the scope of terminology management needs (product names, company internal terms);
ii) review any pre-existing glossaries, style guides, or formal communication formats to identify the core terminology base;
iii) establish a workflow process that catalogues, reviews, approves, and deploys new terminology to all stakeholders;
iv) establish an equivalent for each term within each target language;
v) provide access to the approved term base to internal authors, marketing communicators, external vendors and translators.

There were two surveys recently (Hurst 2009) carried out by SDL that underline the importance of terminology management throughout global content creation management. One survey was sent to translators to obtain their view on terminology and the other survey was sent to organisations such as Philips, Siemens, Cisco, etc. The key findings were that terminology is seen as very important but used inconsistently within several departments of organisations, which leads to an inconsistent source text. The surveys also show that organisations and translators do not manage terminology effectively, if at all. This is a weakness that needs to be explicitly addressed in enterprise localisation workflow. A terminology management process should be the basis for multiple localisation workflow instances since it provides the terminology to be used during several localisation projects. Therefore, it is a core component in localisation workflows.

3.3 Recognition of Personnel as a Key Issue

As localisation became a more recognised necessity for global enterprises, there was an increasing awareness of the importance of the people in localisation roles. Today a single localisation project involves several translators, editors, project managers, coordinators, engineers and people responsible for desktop publishing (DTP), to deal with various file types.

Rosner (2009, pp.26–27) surveyed practitioners to find out which was more important: people, technology or processes within localisation. The results indicated that the people and processes are the most important factors. Interestingly, none of the respondents thought that technology was the most important factor. To paraphrase, participants said if you have the right people and the right process in place, even bad technology will not stop you from achieving the goal. This is interesting given the investment in tools and technology in this area and the lack of standardisation with respect to a state-of-the-art localisation process/workflow that explicitly incorporates, and thus organises, people within that process.

Indeed, considering the cultural differences that can arise when the localisation effort is distributed globally (differences between headquarters and local offices and the different languages) this seemingly important factor could become even more critical, exacerbating the need for such a workflow. Steps such as those required to build trust and communication, in such contexts may be particularly desirable.

3.4 Quality and Standards

A core issue in many research fields, including software localisation is quality. Dalmau (2009) suggests that we always get what we pay for implying that, if we pay for a low-cost translation service, we cannot expect high quality. However, defining what we mean by ‘high quality’ is problematic. Dalmau reinforces this suggestion when she said that "we only tend to realize what quality is when it's missing" (Dalmau 2009, pp.51). However, according to O’Hagan (2004) there are two types of quality activities involved in the localisation process:

i) Quality Assurance (QA);
ii) Quality Control.

From one side, QA is the prevention of quality problems. QA can be heightened by planning and documenting activities. Therefore, quality management has to be in place to review and assess the system. From the other side, Quality Control’s aim is to achieve and maintain the quality of a product, process or service. Essential for quality control is the monitoring of activities in order to find problems and to solve them.

These definitions imply that both QA and Quality Control of the entire process are essential for successful localisation, from the receipt until the delivery of a product (Doval 2005). However, quality can only be achieved and refined in the context of a known localisation process.

Rodríguez (2008, pp.44-46) writes about the implementation of quality in such a context and its accompanying quality management system (QMS). He finds that QMSs make a company more transparent: a company shows the quality process in place and ensures it as well. In terms of reliability, product defects occur less due to processes in place to monitor involvement of everybody in the company, setting clear goals and expectations.

In order to put a QMS in place, several principles seem to be used, such as step-by-step planning, company-wide involvement and an assessment of existing processes. Rodriguez points out that it is common that the QA of a company is based solely on its production process, neglecting sales, training, human resources etc. Employees were asked, for instance, how orders are created, how jobs are cycled through the system, how a project is invoiced but there was no mention of the non-process elements in such questions. He asserts that a clear definition of who is doing what, why and how, must be highlighted. This suggests that the workflow should not only discuss the procedures in place but should also define the roles of the personnel involved in these procedures, as suggested in section 3.3.

3.4.1 The Growth of Certifications/Standards

In industry, certification has become an important QA 'tool'. McBride (2002, p.10) points out that "companies who certify their applications enjoy greater market awareness and that they also benefit from 24x7 working efficiency – the most important enterprise benefit of all." In his view, a commitment to quality includes not only technical requirements, but also the public availability of the results (ie: certification). This can lead to a quality product association.

Given the importance of client confidence in a vendor's localisation quality, certifications for quality management and process evaluation have been made under the ISO 9000 standards umbrella (ISO 9001, 9002, 9003) and DIN 15038 (see Doval 2005). Certification is based on adherence to these defined standards and thus it helps to set up certain quality thresholds in how to perform a process, the associated products, services and people.

It should be noted, however, that standards in the localisation world (see the LISA QA Model for translation) only define the QA and the localisation process in general, but do not necessarily guarantee a good translation outcome. A process, for instance, cannot replace the project manager who picks the translator for a job; it only defines the procedure of selecting a translator. Therefore, a quality check of a translation cannot be treated like a check of a manufactured product.

4. Workflow Languages

Given the agenda of creating an enterprise localisation workflow, the question then arises as to the best way to present these elements in a workflow. That is, what would be an appropriate workflow language and workflow management system?

The following paragraphs deal with two workflow description languages: Business Process Execution Language (BPEL) and Yet Another Workflow Language (YAWL).

Both, BPEL and YAWL, are workflow description languages, expressed in XML. That, combined with tool support, means that they are interchangeable. BPEL is the industry standard and YAWL is picked as a growing-in-popularity alternative approach (AL Rossais 2005, p.22).

4.1 Business Process Execution Language (BPEL)

BPEL is a workflow description language to specify and execute workflows (van der Aalst et al. 2005). It "is supported by a lot of enterprise resource planning (ERP) and Workflow Management System Market leaders" (AL-Rossais 2005). According to Recker (2006, pp.521-532), the core concepts of BPEL are the following:

- *Variables* to store process data and exchange messages with web services;
- *PartnerLinkTypes* to define the required ports for message exchange;
- *Basic Activities* to specify operations to be performed in a process (invoked, received, replied web service operations);
- *Structured Activities* for the definition of control flow, e.g. to express synchronisation;
- *Handlers* in the case of faults

Among others, Brogi (2006) believes that BPEL is the most widespread language for composing web services which, according to the W3C are software systems designed to support interoperable machine-to-machine interaction over a network (typically APIs). But BPEL lacks formal semantics. It emerged from previous specifications such as Business Process Modeling Notation (BPMN), Web Services Flow Language (WSFL) and others (Glatard et al. 2009, p.13). Like WSFL, for instance, it includes control as well as data links. BPEL furthermore, has a locator element; this allows a service to be static, local or mobile.

4.2 BPEL4People

BPEL4People is an add-on for BPEL to support/execute and standardise human tasks with BPEL (Zhao 2008). BPEL4People was suggested by IBM, SAP and other companies to provide *People Activities (human tasks)* within existing BPEL processes. This add-on also addresses some recently occurring problems with BPEL, such as task authorisation.

So this variant of BPEL was extended with human tasks which can be invoked as web services (as BPEL uses individual web services as atomic elements (Zhao 2008, p.195). The human task is associated with a person by specifying roles and defining the permissions associated with the task, using a *potentialOwner* element (OASIS 2010). In this case, a person must notify the business process engine when a task is finished, either successfully or unsuccessfully. In order to execute and monitor processes, a task list is used. Tasks can have a status of hold, queried, claimed, revoked and failed (Zhao 2008, p.196).

BPEL4People also introduces the concept of *PeopleLinks* to bind a group of people to a business process (similar to *PartnerLinks* – see 5.1). This concept allows the suspension of a business process until a task, assigned to a person or a group, is completed. Interestingly, BPEL4People also allows constraints (authorisation constraints) to exclude users from performing certain tasks due to bad performance in previous tasks.

4.3 Yet Another Workflow Language (YAWL)

This workflow language was developed as a joint effort by the university of Eindhoven and Queensland University of Technology. It is an execution language with the goals of handling complex data transformations and web service integration. Brogi (2006) states it is the 'lingua franca' with which to express web services.

YAWL is based on high-level Petri Nets (advanced synchronisation, multiple instances and cancellation patterns are added, therefore defining extended workflow nets, Glatard et al, 2009, p.14). Petri Nets are designed "for modelling, analysis and simulation of dynamic systems with concurrent and non-deterministic procedures" (List and Koherr, 2006, p.1535) and so they provide these additional functionalities. They provide these on the basis of formal semantics and thus offer an abundance of analysis techniques (van der Aalst et al. 2005, p.247; Brogi 2006).

YAWL's workflow specification is based on a set of extended workflow nets which are in a hierarchical order. There are two kinds of tasks: *atomic* and *composite tasks* (van der Aalst 2005, p. 253). Each composite task refers to a set of workflow nets that are at a lower level in the hierarchy. There is also a top level workflow in the extended workflow nets called the root of the tree-structure (van der Aalst et al. 2004).

4.4 Classification of Workflow Languages

Glatard et al. (2009) report a classification for workflow languages (see Table 1 below). They believe that if a workflow definition gathers functions, data and resources, then it is fully executable. If only functions are defined, but no data or resources are available in the description, the workflow representation is a functional one. If only data is defined and resources are not, we talk about a service workflow representation and if functions and data are defined without resources, we talk about a task graph (Glatard et al. 2009, p.5).

Defined	***Formal models***	***Functional WF***	***Service WF***	***Task graphs***
Resources	Not defined	Yes	Yes	No
Data sets	Not defined	No	No	Yes
Functions	Not defined	No	Yes	Yes

Table 1: Classification of workflow languages

BPEL/BPEL4People is a service workflow where functions and resources are specified. YAWL is considered to be a service workflow: Even though YAWL is built on the Petri Nets formalism, its goal is "to overcome the expressiveness limitations of the contemporary workflow management systems" (Glatard et al. 2009, p.14) and it acts like service workflows (van der Aalst & ter Hofstede 2002).

Ko (2009), providing a summary of all prominent workflow languages and their status, shows BPEL as an industry standard and an execution language as well as a stable standard. In contrast, YAWL has an academic background, but also is an execution language. It is not yet a standard, but is considered stable.

5. Workflow Tool Expectations

Alonso (1996) declared that "workflow management systems would become the technology of choice to implement large and heterogeneous distributed execution environments where sets of interrelated tasks can be carried out in an efficient and closely supervised fashion".

Furthermore, Alonso (1996) pointed to the appealing characteristics of this technology: decentralisation of the corporation, decentralisation of the decision making, the need for very detailed information about daily activities, the increasing availability of distributed processing technology.

Since the demand for workflow systems is increasing, more tools have been developed but the tools are now facing the expectations of scalability and system-wide reliability. In the following paragraphs, we will deal with three characteristics that seem to be the major issues for such tools/systems (Muth et al. 1998): scalability, synchronisation and fault handling.

5.1 Scalability/Performance

Since we deal with enterprise localisation, we are concerned with huge amounts of translatable content, and the involvement of many people. Therefore, the system should be able to cope with many tasks (often in parallel) which are mainly automated (Alonso 1996, p.5). According to Alonso, the system must have an architecture appropriate for this. He also implies the necessity for component design in a modular fashion for further system customisation (Heinis et al. 2005). Muth et al. (1998) state that scalability dictates the overall workflow processes and must be distributed across multiple workflow engines running on different servers. This partitioning may also lead to a partitioning of workflows (Muth et al. 1998, p.2).

5.2 Synchronisation/Parallelism

To express parallelism in a workflow is of high interest for grid-enabled workflows (Fox and Gannon 2006). In the current Grid context, they define a workflow as follows: "The automation of the processes, which involves the orchestration of a set of Grid services, agents and actors that must be combined together to solve a problem or to define a new service". For non-task graph workflows, according to Glatard et al. (2009), BPEL was recently enriched with a *foreach* operator to include parallel control structures. It can further distinguish between parallel constructs where the number of tasks is known beforehand and where the number of tasks is unknown beforehand (and can only be discovered during execution). For this, an alternative was developed where data parallelism is implicit in the language. This means that only data flows are represented and the data description is externalised. The process description and the data sets to be processed lead to a parallel data flow (Glatard et al. 2009, p.20). The ability to

synchronise concurrent data flows is important, as every workflow language handles data synchronisation differently.

5.3 Fault Handling

In workflow environments, a system needs to handle exceptions and faults, when an operation is cancelled. Errors can be unpredictable and can lead to a system crash. Therefore, a notification mechanism is needed. BPEL for instance supports different types of fault handling which provides a good recovery mechanism. According to Akram et al. (2006), the 'fault' can be network problems or unavailability of services. Another characteristic of 'fault' termination is clean up. Akram et al. (2006) point out that BPEL supports such clean-ups, through so called compensation handlers in an event (fault).

6. Prototype Workflow Challenges

6.1 Literature Review

In terms of our methodology, we reviewed localisation publications from 'MultiLingual' and 'Localisation Focus – The International Journal of Localisation' as well as several other books and journal articles from industry and academic experts, to see the literature status of workflows' existence in enterprise localisation. Only a limited number of articles were found, over a review period of ten years, which were relevant to our agenda. (We rejected papers reporting on tool presentations, irrelevant surveys, and company specific articles.) These were articles that reported on *elements* of localisation processes relevant to enterprise localization. The identified 'Enterprise Localisation elements' were augmented by additional data from practitioners who identified several of their workflows to us. This is the basis on which our initial workflow abstraction, presented below, was derived. But it should be noted that further work should probe this prototype model in greater detail.

6.2 Workflow Representation

There are two approaches to cope with these workflow language challenges: to either develop an extension (e.g. BPEL4PEOPLE) or to combine languages/systems in order to re-use existing resources (Bernauer et al. 2003). At this research stage, a combination of approaches would seem to be the best solution (Fischer 2005, pp.20-21) based on BPEL. The Workflow Reference Model of the Workflow Management Coalition (1995) declares that it is common to combine a set of applications in order to provide the best and most efficient output. We have also seen that ERP tools (Wortmann 2006) are used to execute appropriate project management for enterprises (e.g. accounting, invoicing, order tracking, etc.); therefore, a combination of an ERP tool with a workflow language is desired for completeness. BPEL is a commonly used industry standard and seems to facilitate easier integration of ERP tools; this is the reason we support BPEL primarily as the basis for our combination of languages. But further research needs to be done to substantiate this claim and to see if other workflow languages are more suited to the extended workflow defined.

6.3 Preliminary Framework

We now propose an initial prototype framework for Enterprise Localisation within which enterprise localization workflows can be defined (See figure 1). The first step is to define

the process (for instance what to localise, resources and budget). This leads to the project enactment/kick off. This, in turn, leads to a decision on how to proceed: either using an ERP tool such as *Plunet BusinessManager* (for accounting, invoicing, project management) or using a translation management system[1] (TMS) such as *GlobalSight* or *SDL WorldServer*. When the ERP tool is used, it will provide a more holistic solution giving, for example, better monitoring of the depreciation and appreciation of company assets. If the ERP solution is chosen then a connection should be made to TEnTs to process the localisation further. The defined process ends with the delivery and the invoicing of the localised content. The overall process is monitored in case of faults, delays or cancellations. In our framework, another element entitled 'Personnel monitoring and feedback' is added. Personnel are a key issue as seen in section 3.3 and their involvement should be present throughout the whole workflow. Feedback refers to both communicating the feedback and subsequent training.

Workflows such as terminology management, layout or file engineering are not shown in Figure 1 and will be the subject of further studies. Since the figure shows a high level process, the connection of e.g. the ERP tool and a translation tool is not made explicit.

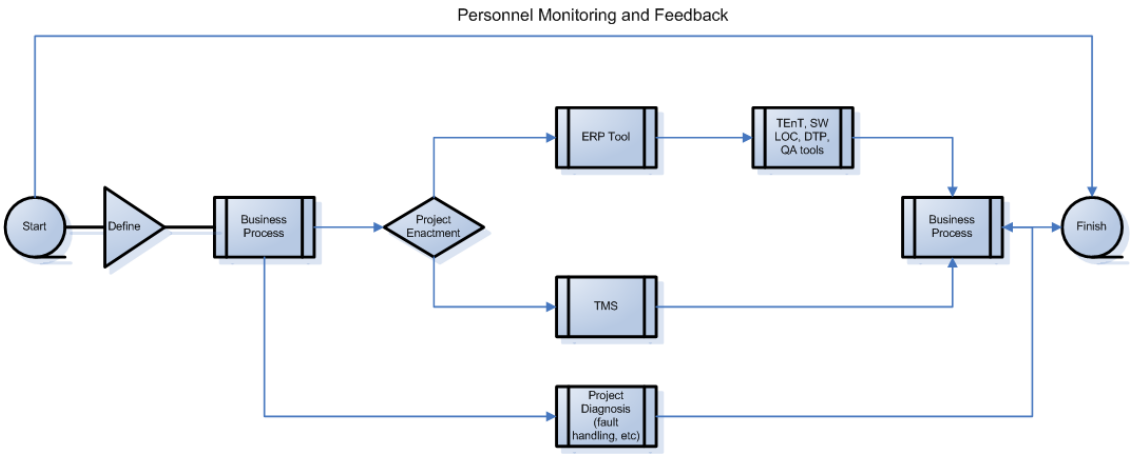

Figure 1: Workflow Prototype at a high level

Likewise, as linguistic resource management lies beneath both the ERP/TEnT tools and TMS nodes/processes, it is not included at this level of granularity, but should appear in subsequent refinements of the workflow elements.

In our opinion, it is unlikely that existing workflow languages are sufficiently rich to represent the localisation process required, but this needs further research to show in detail the struggle in handling all of the criteria specified above to a sufficient extent for enterprise localisation. One issue may be the interoperability of different localization components e.g. to execute project management. This topic as well needs further research on the lack of standards and the establishment of standard procedures.

[1] Often companies develop, use and rely on their own TMSs and plug-in different components.

In investigating Translation Memory Systems (TMS), we discovered the missing project management features an ERP tool would have. TMS show certain automation without a manual interruption but speed and flexibility need further enhancement. These systems are often web based and may have a Java editor to set up workflows within the system. This is a good approach to access the TMS and to implement workflow options but those systems lack performance when it comes down to the actual translation process within the system itself. It can take up to several seconds to move on to the next translation unit. At the end of the day, this may lead to less productivity and lesser translation.

7. Summary and Conclusion

This paper has shown us the importance of defining a standard workflow for enterprise localisation. We started with an introduction to localisation and focused on enterprise localisation. After referring to the characteristics of an enterprise, we then described some localisation issues relevant and important for the enterprise localisation process, i.e. automation, linguistic resources, and recognition of localisers. Later the paper covered some standards of QA and their growth and adoption over the years.

A large part of the paper pertained to workflow languages, more precisely BPEL and YAWL. Also workflow tool expectations and specifically scalability, synchronisation and fault handling were furnished. We finished with workflow language challenges and the solutions to overcome them; our workflow suggestion covers the current business process with our recommendations for better monitoring.

In fact, the real focus of the literature so far has been on tools and technology and on individual activities, rather than on providing a generic workflow across activities, incorporating humans. These activities include, among others, project management, and linguistic resources management. We believe that a standard enterprise localisation workflow should be in place in order to achieve effective automation, linguistic resources organisation and terminology management, QA, standards compliance, as well as clarification of the tasks and people involved. Future work will elaborate on figure 1 to provide such a workflow.

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