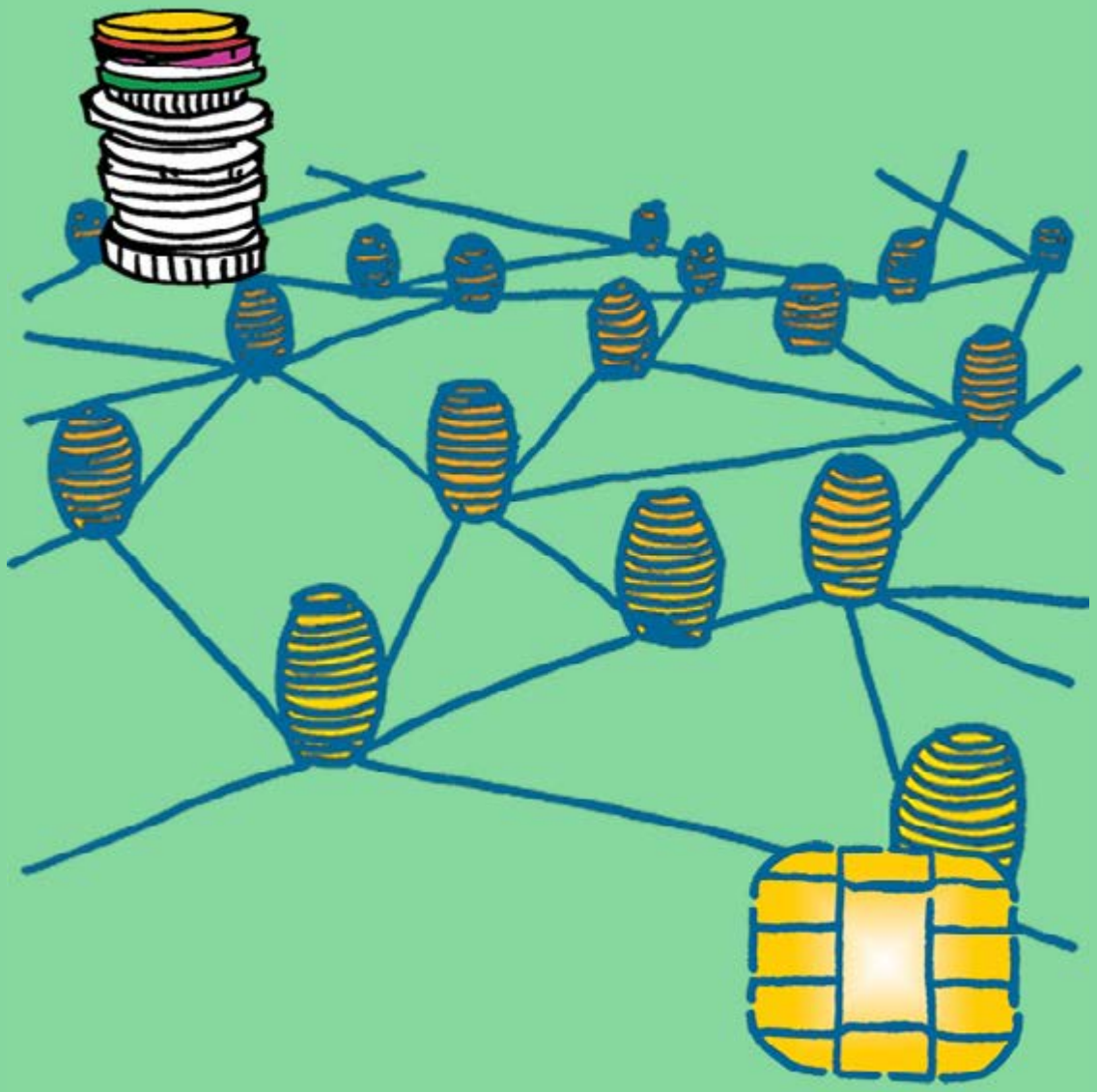
The Pros and Cons of Blockchains in L10n Workflows

A TAUS White Paper



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the language data network

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How I Got into Blockchains

A question I was asked is how did I become interested in blockchains. The simple answer is my interest in food integrity. Is what someone buys in a grocery store or restaurant the "real product" or is it misrepresented in some way? For example, a few years back, Oceana, a nonprofit ocean conservation group, examined salmon being sold at restaurants and grocery stores in four major US cities. Overall, over 43% of the salmon were misidentified – some were farmed-raised rather than wild caught as claimed, or were a less-costly type of salmon, or were an entirely different species of fish (rainbow trout). Fraudulent misrepresentation of olive oil and wine are two other well-known examples. I had read that there are early initiatives using blockchain technology to reduce or minimize fraud with these three food groups by tracking each transaction from the food source to the final consumer.

Now for the leap to the L10n industry. It was not the fraud or misrepresentation aspect of fish, olive oil, or wine that got me thinking of applying blockchains to L10n workflows. Instead, it was the underlying notion of tracking a product through a supply chain. I became interested in whether the tracking functionality inherent in blockchains could be applied throughout the translation process, thereby, reducing the human effort involved and streamlining the workflows involving translation, reviews, and payments. I tried clarifying my thoughts and the result is this paper.

About the Author

Bob Kuhns is an independent consultant specializing in language technologies. His clients have included the Knowledge Technology Group in the Sun Microsystems Labs and Sun's Globalization group. In the Labs, Bob was part of a team developing a conceptual indexing system and for the Globalization group, he was project manager and lead translation technology designer for a controlled language checker, a terminology management system, and a hybrid MT system. He was also responsible for developing translation metrics and leading a competitive MT evaluation. Bob has also conducted research and published reports with Common Sense Advisory, TAUS, and MediaLocate on a variety of topics including managed authoring, advanced leveraging, MT, and global social media.

Introduction

Any transfer of an asset requires accountability, transparency, and security and blockchains meet these requirements by providing secure peer-to-peer asset transfers. Much has been written about blockchains and their wide applicability within a range of industries including financial, shipping, and real estate. The localization industry is no different from other industries in that the stakeholders and participants in translation processes desire the same security when sharing their intellectual property such as proprietary source documents, translations, and linguistic assets and when executing and enforcing contracts. This paper therefore explores the utility of blockchains in today's and tomorrow's localization workflows. More specifically, it discusses how blockchains could be a foundation for L10n workflows for improving efficiencies. It also describes implications of blockchains for companies with translation needs, LSPs, and translators. Three models of L10n workflows are examined, namely:

The current As-Is workflow;
The As-Is workflow coupled with blockchain technology as a supporting infrastructure or backbone; and
A blockchain-centric workflow with little, if any, involvement of an LSP.

The advantages and disadvantages of the three workflows are also discussed. Before the workflows discussion, a few preliminaries are in order.

Caveat: Blockchain technology is still very much in its early stages and any large-scale deployment of blockchains to L10n workflows is premature. However, since there is so much buzz about blockchain and the claims about how it could be used in vastly different industries, the L10n industry itself should consider it worthwhile to explore how this relatively new technology could be exploited. The potential benefits could be very large.

What is a Blockchain – a Few Basics?

To use the popular vernacular, a blockchain is a distributed ledger (think spreadsheet or database) shared across a network. Its main purpose is to record and facilitate the transfer of assets, which can be physical (real estate or shipping containers) or abstract (currency or intellectual property).

In a stark contrast to centralized ledgers that rely on a single authority, blockchains are decentralized. Each computer or device on the network has an identical copy of the ledger and each device, called a **node**, replicates, updates, and maintains the ledger independently of all other nodes.

Basically, a blockchain is a continuously growing list of records reflecting details of a deal or a transaction. These records are grouped and organized into blocks. Once a transaction is complete, a block is created and appended to the previous block on the blockchain. A new block is always linked to the previous block using cryptography, specifically, a hash code. Once a block is added to the chain, it cannot be altered or deleted, thereby, ensuring the security of the information in the ledger.

Several Key Features of Blockchain Technology

Blockchains are:

Decentralized or distributed – A blockchain is replicated, updated, and maintained by each

node or device on a network. This is in contrast to a centralized system where a single node maintains and controls access to a ledger.

Transparent – Since the blockchain and every appended block are replicated and updated at each node, there is a full audit trail across the network.

Immutable – Transactions represented as blocks are added, that is, appended to the blockchain. Once a block is appended to a blockchain, it cannot be edited or deleted resulting in the permanence and security of a blockchain.

Traceable – Each node on the network has information of where an asset came from (the sender) and its recipient as well as all the changes to that asset over time. In other words, blockchains provide provenance of an asset.

Note: It is important to remember that bitcoin and other cryptocurrencies are applications built on top of blockchain technology, which provides the mechanism for secure exchanges of these types of currencies. Any rise or decline in value in cryptocurrencies is independent of the underlying blockchain technology.

What is a Smart Contract?

Besides blockchains, another critical piece of the technology are smart contracts. Like traditional contracts, a smart contract is an agreement between two or more parties. However, it is not an agreement on paper; instead, it is computer code. Each smart contract is in the form of a conditional or if-then statement such as "If X does Y, then execute Z." Once the conditions are met, the smart contract executes an action such as sending payment for services rendered.

Smart contracts differ from traditional ones in that there are no intermediaries. In ordinary contracts, if you want to buy or sell a home, lawyers and banks become involved to ensure that a sale is legitimate and the finances are in place. With smart contracts, the lawyers and banks are removed during the buying and selling phase. For instance, assume there is a digital key to the house. A smart contract is written specifying what conditions (legal issues, house inspections, and price of the house) must be satisfied before the actual sale can be completed. Once the house is certified as saleable and meets inspection, the buyer sends in the required payment to the seller. Once the conditions of the smart contract are satisfied, the digital key is automatically sent to the buyer. As added value, each phase of this house buying process is recorded in a blockchain.

A Simple Example to Illustrate the Blockchain Model

To illustrate how a blockchain could come into play with localization, consider this simple example. Suppose Company A wants to have a set of documents translated from English to Japanese. Further suppose that a LSP-JA specializes in English-to-Japanese translations. To get the project started, the Company A initiates a project with the requirements of English->Japanese as the language pair, a budget, and a timeline. This information is recorded in a block on a blockchain. A smart contract is written indicating that

> "if translations are acceptable (at some accuracy level) and is at or under budget and meets the timeline, then the translations are accepted and LSP receives payment."

The LSP is contacted by the company and accepts the project. The blockchain through a smart contract initiates the release of the source texts to the LSP and a block is appended to

the blockchain indicating the transfer of source texts from Company A to LSP-JA. Once the translators are vetted (correct language pair and certification), a smart contract is executed and the source texts are sent to the appropriate translators. The record of transfers of source texts from the LSP to the translators are appended as blocks onto the blockchain.

Upon completion of translating their respective texts, smart contracts are executed and the translated texts are forwarded to the LSP for review. Blocks are added to the blockchain indicating the transfers of the target files. Once the files are reviewed for translation accuracy, a smart contract is executed and the translated files and invoices are sent to Company A. (To keep the example simple, it is assumed that the translations are good the first time around.) A block is entered on the blockchain showing that the LSP has sent the approved files and invoice to Company A.

Finally, the arrival of an invoice invokes a smart contract and payment is sent to LSP-JA from Company A. Another block reflecting this payment is then added to the blockchain. This transfer of funds to LSP-JA triggers another smart contract that provides payment to the translators. Those payments are documented by another block on the blockchain and that finalizes the project.

Translation Workflows with and without Blockchains

This section describes three L10n workflows, namely, the current As-Is workflow, the As-Is model augmented with a blockchain, and another with a blockchain as the main driver for the L10n process. Advantages, disadvantages, and a brief discussion of each model are provided.

Note that the three models presented are much simplified compared to what is found in the day-to-day business of localization. They involve only three groups of participants, namely, a company with translation needs, LSPs, and translators. Since the goal of the paper is to illustrate how blockchain technology could be used by and benefit the L10n community, the simple models should suffice. It is true that actual L10n processes involve translations technologies such as TMs and MT, and these technologies naturally fit into the blockchain models. After all, sending source documents to an MT engine and getting translations in return is another form of asset transfer and would be recorded by a blockchain as with any other transactions.

The As-Is L10n Workflow

The simplified current L10 Process is LSP-centric as shown in the graphic on the next page.

Description

The basic As-Is L10n process starts with a company needing a set of documents translated. The company will also have a set of requirements including:

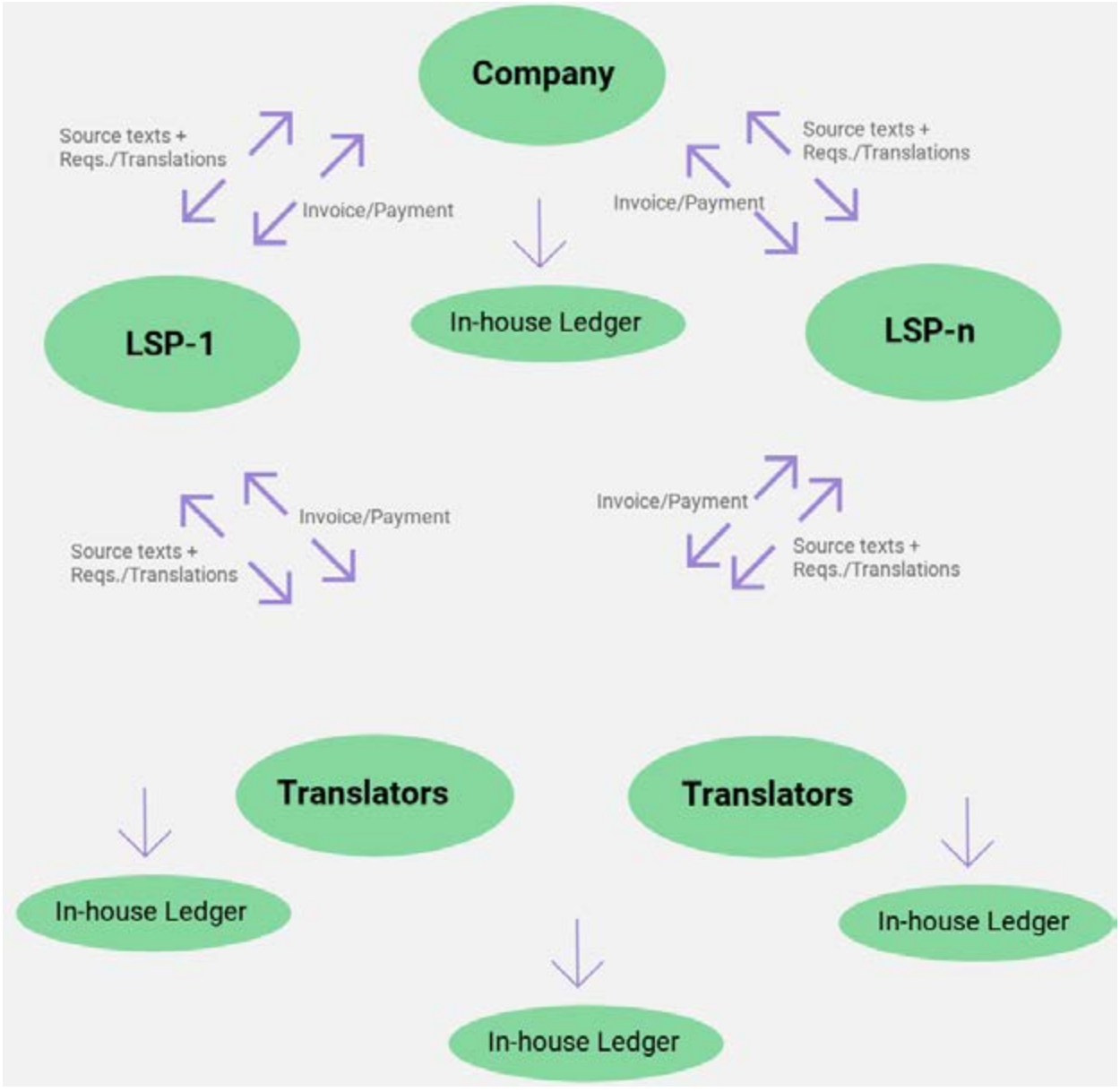
a. **Target languages** satisfying their basic requirements. There is usually more than one target language.
b. **Budgets** reflecting the money that the client has allocated to translation of its documents. The budgets could differ depending on the target language.
c. **Datelines** indicating when the client expects to have the reviewed and LSP-approved translations.

The As-Is workflow is roughly as follows:

1. Once a company identifies its translation needs and compiles a list of requirements, it identifies LSPs that have credentials to translate into the different target languages.
2. When a LSP has accepted the project, the company provides the LSP with the source texts.

This transfer is done by email, an upload, or granting access to a server containing the source documents. A vendor manager or a system administrator usually performs the transfer.

3. At the initiation of the project, a manager at the company creates some sort of ledger or spreadsheet for project management purposes and a project manager maintains it throughout the project's life cycle.
4. The LSPs receive the documents with the requirements and budgets and each LSP creates its own spreadsheets for its own project management purposes.
5. The LSPs send the documents to their translators (usually freelancers) with requirements (timelines) and budgets (money set aside for translators) once the translators are approved. The LSPs update their spreadsheets to indicate what was delivered to which translator and when. The translators might create their own ledgers or spreadsheets for keeping track of their progress and time spent.
6. After completing their translations, the translators email or upload the translated documents to LSPs for review. The translators and the LSPs update their respective spreadsheets to reflect the transfer.
7. LSPs might send documents back to translators for corrections and their respective spreadsheets are updated regarding the transfer.
8. Revised translated documents are sent back to LSPs from the translators for final validation



together with invoices for services rendered. Spreadsheets at both ends are updated again reflecting the transfer of the corrected translations and the invoicing.

9. After review of the translations, the LSPs send the validated translated documents to the company. The LSPs update their ledgers noting the transfer of translated documents to the company and the company documents the receipt of translations.
10. Once the translations are accepted, the LSPs invoice the company for final payment. LSPs update their ledgers and the accounts payable department at the company records the invoice and details of the payments to the LSPs.
11. LSPs make final payments to their translators and each party updates their spreadsheets. The project is complete.

Advantages

The As-Is L10n workflow is well established and is used by most localization projects. Some its key benefits are:

The process is known

The As-Is workflow is how translations get done today for small, medium, and large companies and large volumes of documents do get successfully translated. In other words, the As-Is model works.

LSPs manage the translation process

By managing the translation process, the LSPs remove practically all the burden of the translation process from the company. The LSPs find the translators, interact with the translators, manage translators, perform translation reviews, track timelines, and manage budgets for the actual translation work. They ensure translation quality by reviewing each translator's work.

L10n supply chains remain intact

For most projects, the LSPs and translators are known. Companies have developed relationships with LSPs which in turn have a pool of translators they can tap into. These relationships are important for expediting project team building and ensuring quality.

Disadvantages

Despite being the standard workflow, the As-Is model has several weak points.

The company is removed from the state of localization process

With LSPs being the intermediary between the company and the translators, the company must rely on periodic updates on the project's progress instead of just wondering, "Where are my translations?". That is why the company has vendor managers who communicate directly with project managers of the LSPs. This additional layer of management introduces more complexity to the model and increases localization costs.

The LSPs must deal with numerous translators and time zones

Since the As-Is workflow is manually based, localization project managers must manage all aspects of the process. This includes translators on perhaps several projects for different clients and across different time zones. While there are translation management systems, they are tools to support human managers rather than to automate tasks. The management of a project's progress by a localization manager requires continuous tracking of each phase of the project and updating some sort of ledger or spreadsheet at each step.

With the need to track different translators on different projects, the localization managers at an LSP are stretched thin. Furthermore, time differences make the job more difficult since

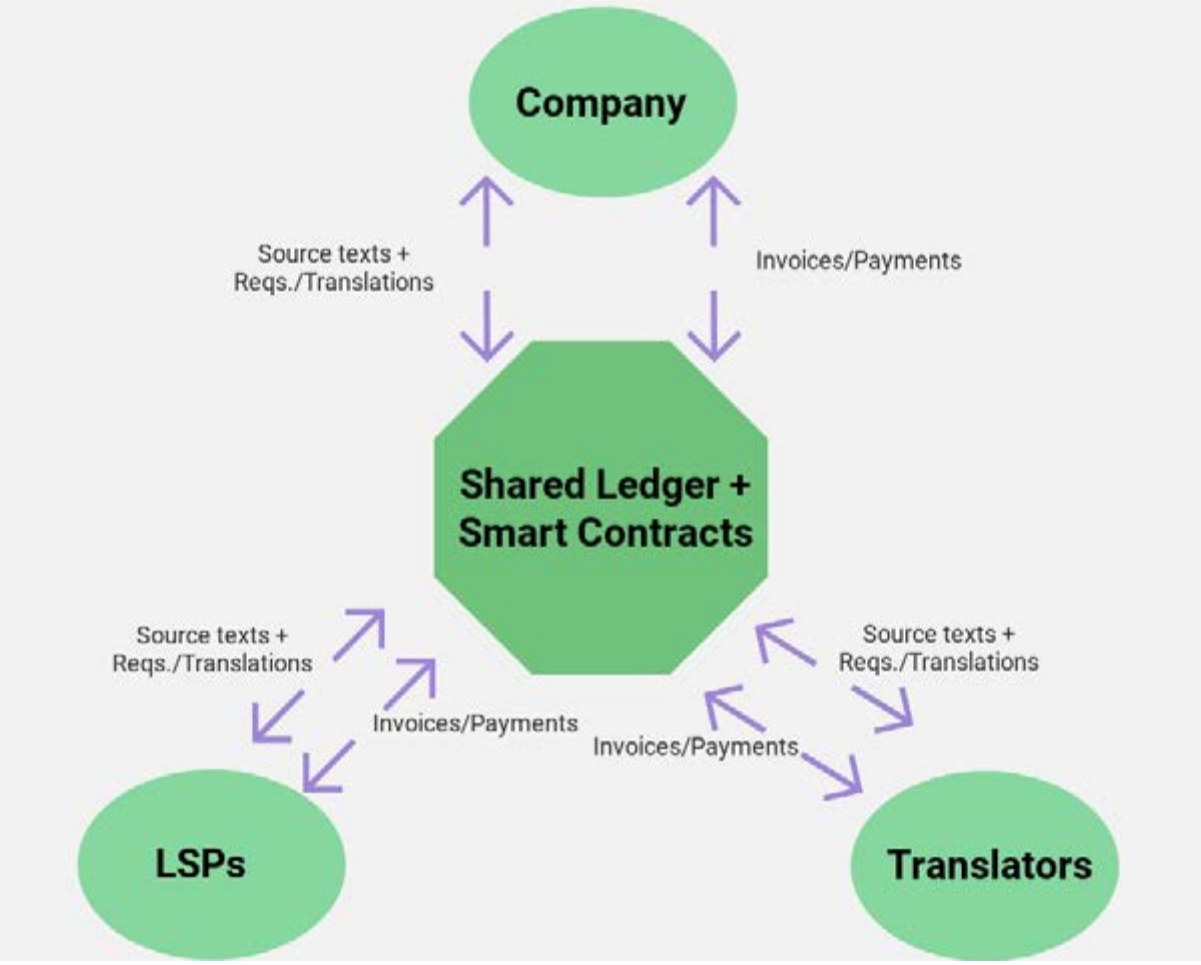
calls may be practically impossible and the reading of and responding to emails or texts or just answering translator's questions from different times zones could delay progress by a good chunk of a day.

Payments to translators are a task in itself
Payments and costs associated with a project are handled via standard purchase order/invoice model with potential delays in payment. Translators want to be paid as soon as possible and the standard purchase order/invoice process is cumbersome and time-consuming. Moreover, the LSPs must maintain the latest information about each translator's banking information such as currency and routing particulars, thereby creating a monotonous task not necessarily directly related to translating.

Discussion

The current workflow is labor-intensive, and time-zone differences compound any problems arising during the translation process. A small revision to a source document by the client will require a rapid response from the LSP in order to maintain what is probably already a tight schedule.

As seen in the description, the company (including vendor manager and accounts payable), the LSPs, and the translators all keep a record of sending and receiving source and target files. Records could also contain other information and notes regarding quality of source/translated texts, terminologies, or TMs. As noted, translation management systems are useful, but much of the record keeping is manual even in these systems. A system that could automate transfers between localization participants and automatically document them would be welcomed by everyone in the process.



A Mild Blockchain L10n Workflow

The As-Is L10n workflow obviously does not include blockchains. Tools such as translation management systems are used in the As-Is model, but these are support tools for humans and a fair amount of effort is needed to update spreadsheets and track progress including invoicing and payments. Alternatively, blockchains provide an opportunity for maintaining the participants in the L10n workflow while facilitating the translation process beyond what it is today. This section proposes a modest integration of a blockchain foundation into the As-Is workflow.

Description

In this model of an L10n workflow, blockchains together with smart contracts facilitate many aspects of communications between the company and the LSPs and the LSPs and the translators. Smart contracts can be written to transfer files between the appropriate parties and each transfer is automatically recorded.

The workflow in this model is roughly:

1. A company creates and populates a project and its requirements such as target languages, timelines, and budgets on a blockchain and transfers ownership to the LSPs.
2. The LSPs record the translators, timelines, and budgets and this information is stored in a block that is appended to the blockchain.
3. When a translator is qualified (meets certification and approves the timeline and budget), a smart contract specifying the conditions of transferring source documents to the translators is executed and the files are automatically sent to the translator. The transfer is recorded on the blockchain.
4. Once a translator completes the translation and if all the associated requirements are met by the translation, a smart contract is executed and the translated files are sent to the LSP without manual intervention. The transfer is automatically recorded on the blockchain.
5. Another smart contract is executed and an invoice is sent to the LSP on behalf of the translator. The blockchain is updated with the invoice information (for instance, date, amount, and word count).
6. Once the LSP has all the translations from the different translators and they meet all the requirements such as translation quality, a smart contract is executed and the translated documents are automatically sent to the company. Again, the transfer is recorded.
7. A smart contract is triggered and an invoice for the LSP is sent to the client. This transaction is recorded with all the details of the invoice.
8. Upon the receipt of the invoice by the company, a smart contract is executed and payment is transferred to the LSP and the transaction is recorded.
9. The receipt of payment by the LSP invokes another smart contract resulting in payment to the translators and another block being added to the blockchain.

It is worth emphasizing that each of the steps just described results in a block being appended to the blockchain, thereby documenting each transaction without any manually-edited spreadsheets. Also, all transfers initiated by smart contracts (computer code) such as source and target language file transfers are completed without human intervention.

Advantages

Blockchains bring transparency and automation to the location process while easing the burdens on vendor and localization managers. Blockchains also allow for quicker invoicing and payment for the LSPs and the translators.

Blockchain keeps the company and the LSPs in the loop
The ongoing state of the entire project can be viewed both by the LSP and the company's vendor managers, thereby, improving transparency. Since blockchain improves transparency of each phase of a project, the need for constant communications, such as calls and meetings with the vendor managers and LSPs localization managers, is reduced and time gained by the project managers can be refocused on other activities.

LSPs are still managing the translation process
With the mild blockchain approach, the overall structure of the workflow is not significantly different than the As-Is workflow. The LSPs are still in the loop and are still the intermediaries between the company wanting the translations and the translators.

Transfers are automatic
With smart contracts, file transfers, invoicing, and payments are self-executing once a smart contract is satisfied. Moreover, each transfer is automatically documented without manual intervention. Again, this is a time saver for project managers and even the accounts payable departments.

Translators' quality can be tracked
When source text is outsourced to a pool of translators, it is difficult to trace the source of a translation issue. With blockchain, a translator could include their digital signature on the blockchain and the translator in question could be identified to help resolve any translation issue. In addition, translators who deliver very high quality would be identifiable and sought after for future critical translation needs.

Disadvantages

Although the workflow is not significantly different from the As-Is model, it is to be expected that there will be resistance with changing the procedures of how translating is conducted today.

Blockchain technology is under development
Blockchain technology is new and to say embryonic would be an understatement. It is unclear if this model is a viable option today.

LSPs' day-to-day tasks would change
While LSPs would still be the interface for both clients and translators, their day-to-day tasks would change. Since blockchain is essentially a ledger (spreadsheet), some work, such as updating spreadsheets by project managers, would be automated. However, given human nature, changes to the way things have always been done would probably meet with resistance, even if it might save time and money.

Building the backbone requires special expertise and additional costs
Even if the blockchain technology is ready to be deployed, companies and LSPs would have to invest financially to integrate the blockchain technology within their organizations. There would have to be further investment to have technical staff maintain the blockchain technology. It might be worth noting that some of these disadvantages could be reduced by blockchain technology as a service (SaaS), thereby, eliminating the need for internal deployment and staff with specialized blockchain technology. However, some expertise would still be needed to support the company's side of the service. See the section: Blockchain Deployment within L10 Industries for a discussion of options.

Discussion

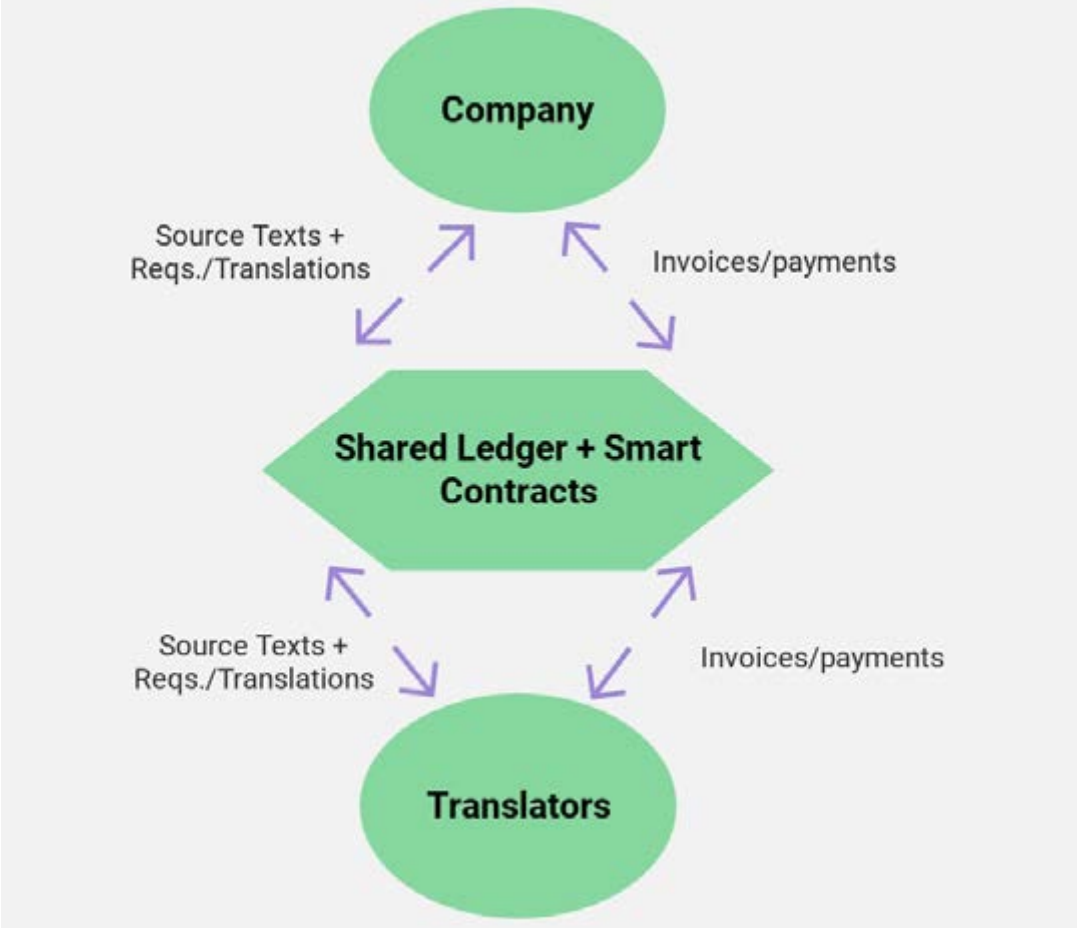
The mild blockchain approach to L10n is a cautious way for companies and LSPs to introduce themselves to blockchain technology and its potential benefits and efficiencies. Recall all the spreadsheet updates and manual file sharing in the As-Is workflow. These tasks would practically be eliminated with blockchains and associated smart contracts that execute automatically when their conditions are met.

The mild approach does not change roles of the participants in today's workflow. The company with translation needs would still use their vetted LSPs and the LSPs would still use their known translators in the process. None of that would change. That in itself should relieve some pushback on bringing new technology into the process.

The traceability of translation to the actual translator can save time and money by finding the source of quality issues and their resolution quicker than the way it is done today. Moreover, translators who perform exceptionally well could be identified and used for future critical translation tasks without major risks.

Blockchain-centric L10n Workflow

The last of the three workflows discussed is the most radical. Critically, this mode does not include LSPs. Companies with translation needs will engage translators directly throughout the entire localization process without any intermediaries.



Description

The blockchain-centric L10n workflow is a complete break with the previous workflows in that the LSPs are eliminated. One key advantage of blockchain technologies is that they enable the development of applications for peer-to-peer asset transfers, thereby eliminating any

intermediaries. Bitcoin is the well-known example of peer-to-peer transfers, where two parties exchange currency, namely, bitcoins, without the need for banks.

This workflow makes the assumption that vendor managers know translation companies or translators whom they can contact for their translation needs.

The workflow in this model is as follows:

1. A company creates and populates a translation project and its requirements such as target languages, timeline, quality level, and budget on a blockchain.
2. The company records the translators, timelines, and budgets and this information is stored in a block that is appended to the blockchain.
3. When a translator is qualified (meets certification and approves timeline and budget), a smart contract regarding translator qualifications and file transfers is executed and the files are automatically transferred to the translator. The transfer from the company to the translators is recorded on the blockchain.
4. Once a translator completes the translation and if all the associated requirements are met by the translation, a smart contract is executed and the translated files are sent to the company without manual intervention. The transfer is automatically recorded on the blockchain.
5. Another smart contract is then executed and an invoice is sent to the company on behalf of the translator. The blockchain is updated with the invoice information.
6. Linguists at the company review the translations. If they are accurate, a smart contact is invoked and payment is sent to the translator. The payment is recorded.
7. If the translations are unacceptable, the files are returned to the translators for revision in accordance with a smart contract. Payment to the translator is withheld at this time because the smart contract had a condition regarding translation quality.
8. The revised translations are sent back to the company and recorded.
9. If the translations are now acceptable, a smart contract then triggers payment to the translator. If the translation is still problematic, then steps 7. and 8. are repeated.

Advantages

In this model, the only participants are the company needing the translations and the translators. The company sends its source files directly to the translators who in turn send their translations to the company. Some of the benefits here are the same as with the LSP-centric workflow.

The company with translation needs directly drives the project

Since all transactions are on the blockchain, the company is aware of the progress or any delays of the project. Of course, blockchain does not eliminate the need for some LSP-like project management for supporting the translators (resolving issues) and for performing in-house translations reviews. The transparency provided by blockchains reduces the chances of unpleasant surprises such as overrun budgets or missed deadlines.

Payments to the translators would be quicker than in the LSP workflows.

Once work is completed, a smart contract is executed sending an invoice to the accounts payable department at the company. If all conditions of that invoice are correct, another smart contract is executed and payment is made directly to the translator.

The workflow is simplified

Without a fully-engaged LSPs, the workflow is streamlined, that is, the middle layer of project management between the company and the translators has been removed. This simpler model would reduce translation costs and could reduce the localization time for the overall project.

Translators can be identified
If each translator uses their digital signature on their translations, vendor managers could assess each translator's work. Over time, the vendor managers could automatically create a directory of translators who have an excellent performance record and use them on future projects.

Disadvantages
Some of the disadvantages of this workflow are the same as the mild blockchain model. Blockchain technology is still under development for one. Without LSPs, the company would be required to take on more tasks. Also, the company would have to invest in developing staff who could deploy and maintain the blockchain technology.

Vendor managers might resist change
As with the mild blockchain model, there could be resistance by the vendor managers at the company for assuming new responsibilities and roles.

Companies would need in-house translator reviewers
Since companies would have to perform the quality checks of translations, they would need in-house linguists for each of the target languages. In the short term, that might require additional investment in their localization departments.

Finding translators could be a challenge in the short term
Since LSPs are the intermediaries between the company and the translators, many of the translators used on any given project are unknown to companies. Without the contacts that the LSPs have, companies could initially have difficulties identifying a pool of trusted translators. In short, finding good translators might take some time.

Discussion
This model makes the assumption that vendor managers know translation companies or translators whom they can contact for their translation needs. This assumption becomes reality in this model because the company will have direct access to translators through their digital signature and their translations. In that way, the companies can identify those translators doing quality work on time and within budget. Employing the best translators will improve translation quality and will save time and money.

The blockchain-centric model lends itself to crowdsourcing translations. With crowdsourcing, the role of blockchain is even more critical. The translators are unknown or mostly unknown and they are translating a company's documents, its intellectual property. This could pose a risk for the company. For instance, an intentional mistranslation would be problematic for the company and its brand depending upon the information contained in the documents and how it was mistranslated. Since a smart contract would initiate a document to be sent to a translator and since a blockchain would record each handoff or transfer of source texts, the recipient would be known and could be held accountable. One possibility is that a smart contract be put into place blocking a problematic translator from receiving or uploading any more translations which would help resolve future potential problems.

Sharing L10n Ownership with Blockchains
Blockchains securely record all transactions of data transfers. This addresses data ownership issues and allows for greater sharing of linguistic assets among companies, LSPs, and translators. There is a lot to gain from this type of technology for *transferring and sharing of*

linguistic assets and blockchains could potentially benefit translators as they would have more control over their translations, that is, their intellectual property.

Assumptions about the L10n Community

The L10n community is only very loosely a community. It consists of companies with translation needs, LSPs, and translators. Each of which wants to improve L10n workflows for different reasons.

> Companies obviously want to minimize their translations costs; they want high quality translations at the least price possible.
> LSPs and translators want to maximize their profits, while LSPs will try to drive down costs on the translator's side.

However, all three participants want to improve efficiencies – companies want their translations as soon as possible for delivering their own localized products or services quickly, while LSPs and translators want to complete their jobs, do a great job, and get paid.

A solution to these tensions is to allow sharing of linguistic assets using blockchains and to reward those for improving the entire process.

Blockchain and Sharing and Owning Linguistic Assets

Consider a community of companies, LSPs, and translators working together to bring the best product to market. Each of the participants shares the resources and benefits.

Companies own their source texts. That is a fact. These texts are sent to approved LSPs for translations via blockchains and smart contracts. These are, in turn, sent to approved translators by the same means. Data transfers are recorded throughout the process. The question is who owns what. While the company owns its source content, what about the translated content? Can LSPs and translators improve their ownership rights?

Following several ideas from Exfluency, suppose an L10n cryptocurrency or L10n tokens could be created that would facilitate L10n processes. Tokens would be rewarded for different activities or goals created by the community.

There are several ways that this concept could work. Translators and LSPs could take a stake in improving various linguistic assets, not for one company, but for multiple clients. Of course, companies would have to buy into this model.

Terminologies including domain-specific lexicons, bilingual term databases, and Do-Not-Translate lists would be reviewed and fixed as needed by LSPs and translators. Each cleanup by a translator of any items in these lists, such as eliminating redundancies, and fixing translations, would be rewarded with tokens. That is, each new modification would be recorded on a blockchain and through a digital signature the person making the approved changes would be rewarded with a token.

LSPs and translators have access to TMs. These are often machine generated and contain errors, such as segmentation mismatches. While this may not have a direct impact on human translation, it can have an impact on data-driven MT. With a human involved with correcting the errors, the overall process could improve. A metric could be established that would reward translators or LSPs for their effort in cleaning up TMs.

Putting aside the question of translation ownership, it could be argued that translators own fragments or sub-segmental elements (phrase and clauses) of their translations. LSPs and translators in particular could identify these recurring phrases and approve their translations, and then reuse them with multiple clients. (See an earlier TAUS report on Advanced Leveraging regarding sub-segmental elements and translation.) Since they are not entire texts or sentences, any source ownership issues should not be problematic. These translations of phrases could be built and provided via blockchains to different clients and even to MT systems being trained.

As for how tokens get awarded, there would have to be a controlling agency or perhaps the community that could approve any suggestions or changes to any of the linguistic assets. These reviewers would also be rewarded accordingly with tokens as set by the community for their reviewing efforts.

Cashing in - Where is the money?

Suppose there is buy-in with the L10n community with the overall concept of token-based L10n. A high-achieving translator might spend a lot of time improving various linguistic assets and be rewarded with a large number of tokens. However, these tokens will not buy groceries or pay rent. The last hurdle for the community for these L10n tokens is being able to convert them to fiat currency such as Euros or US Dollars. That is one more hurdle for the community to overcome before this model could succeed.

Blockchain Deployment within L10 Industries

This paper has discussed how blockchain technology could improve L10n workflows and three deployment options exist, namely:

Build a blockchain network in-house;
Employ blockchain as a SaaS; or
Employ a 3rd -party translation industry supplier of blockchains.

Each option is briefly described.

Building a Blockchain Network In-house

Assuming that organizations do not want to develop blockchain technology themselves, there are companies providing blockchain technology. Two prominent ones are Ethereum and Hyperledger.

Ethereum Foundation, a Swiss nonprofit, is developing software called *Ethereum* which it describes as an open software blockchain platform for enabling developers to build and deploy decentralized applications. One key difference of Ethereum compared to other platforms is that it allows developers to write a large variety of smart contracts for automatically enforcing contractual obligations and asset transfers. Ethereum has issued its own currency, called **Ether**. Transaction fees and services on an Ethereum network are paid with **Ether**.

Hyperledger was founded in 2015 when a number of companies came together to create an open-source blockchain technology under the auspices of Linux Foundation. Hyperledger has over 200 organizations as members. The foundation has ten separate projects from a smart contract machine, a module (called Hyperledger Fabric) for managing nodes on a network, a system for mobile apps, a benchmark platform, and an “as-a-service” deployment. Fabric is the core to Hyperledger and it allows for the creation of blockchain networks in any industry.

Employing blockchain as a SaaS

The major benefit of blockchain as a service is reduced implementation costs. The service eliminates the need for dedicated in-house blockchain expertise while gaining the advantages of blockchain deployment.

IBM Blockchain Platform is IBM's entry into blockchains and the core of the platform is based on Hyperledger Fabric. The blockchain service is delivered through IBM Cloud. The IBM Blockchain Platform has the usual blockchain features such as security, transparency, and smart contracts. IBM claims that through IBM Blockchain Platform the development and operational elements of developing blockchain networks are simplified. IBM also states the networks can easily scale as users and additional functionality are added to the network.

Hyperledger CELLO is a blockchain module toolkit for "as-a-service" blockchain deployment. Hyperledger says that this model of blockchain implementation reduces the work for developing, maintaining, and ending blockchains. Note: Hyperledger CELLO is currently under development and its status is currently labeled "Incubation."

Other vendors that offer blockchain as SaaS are Microsoft, Oracle, and SAP.

Employing a 3rd-party Translation Industry Supplier of Blockchains

The last option is one where a blockchain supplier (or suppliers) is created to support the L10n industry specifically. Using its blockchain platform, this supplier would handle the workflows and all the handoffs between companies with translation needs, LSPs, and the translators. Moreover, the supplier must have the resources to develop blockchain technology neutral to the platforms and software languages of organizations in the L10n industry, that is, it would be vendor-independent.

In other words, this supplier would be responsible for developing the network, integrating nodes on the network, writing smart contracts, and maintaining the technology. From a practical point of view, this model would run as a SaaS, thereby eliminating the need of staff for any major blockchain developments and updates at the user sites. This supplier would be responsible for assistance with all the workflow participants.

Since this option is a service, support for the supplier would come in payment for each transaction on the network such a source-target text transfers and execution of smart contracts. As assets are transferred, payments to the supplier would be recorded as blocks on the blockchain and made available to those nodes that have permission to see such information.

Advantages of a Translation-dedicated Blockchain Supplier

1. Clearly, a 3rd-party blockchain technology vendor dedicated to the translation industry would understand the business needs and best practices and requirements of each of the participants, thereby removing technical hurdles from companies, LSPs, and translators

2. Using an outside vendor eliminates some of the startup costs of introducing blockchains. Ongoing costs for maintaining blockchains would be eliminated for the users of the blockchain.

3. Blockchains could reduce redundancies in the development and maintenance of linguistic assets such as terminologies, multilingual dictionaries, and TMs. There would be no need for creating assets when they already exist and could be shared. The sharing and combining of assets could also be used by data-driven MT where large data sets improve translation quality.

Disadvantages of a Translation-dedicated Blockchain

1. Since the 3rd-party blockchain vendor specializing in translation workflows does not exist, one would have to be created. One way is for a group of developers and others knowledgeable of the workings of the translation industry to write a business plan and seek outside funding. That is time-consuming, with no guarantee of success.

One alternative is for a consortium of large companies to pool their resources and support a blockchain supplier. These companies have some technical expertise and money to do just that. By using one of the SaaS blockchain platforms, the time and effort for building a translation blockchain platform would be quicker than starting from scratch.

2. There are reports that blockchain developers are in short supply and demand top salaries. So finding technical staff for a new startup could pose difficulties.

3. Even with a dedicated translation blockchain technology company, the question that remains is whether companies, LSPs, and translators would be supportive. Among other problems, the way they do business would be changed. As with all new ventures, there will be some early problems that could pose a threat to the viability of the startup.

Discussion

It would be a valuable lesson if a company could create a proof-of-concept translation workflow with one of the SaaS blockchain vendors. The benefits and problems with the workflow would show how blockchains improve or hamper translation processes and the industry would have an idea on how to proceed.

Final Remarks

The two blockchain workflows described above mark out a departure from the current As-Is workflow. One of the advantages of the mild-blockchain workflow is that it does not alter the overall structure of the current model. It primarily introduces a new technology into the mix. As with other new technologies, the best way to determine whether blockchains improve localization efficiencies is to implement a prototype or proof-of-concept. This approach requires much less investment than a full-blown system that might not be entirely successful. The proof-of-concept could be tested and evaluated for workflow efficiencies and deficiencies as well as ease of use.

Of the participants in the localization process, namely, companies with translation needs, the LSPs, and the translators, the companies are the obvious candidates to drive the adoption of blockchain technologies for L10n workflows. More specifically, large technology companies with their internal technical staff and knowledge are the most likely ones to back and fund a blockchain proof-of-concept project. The results of an evaluation and lessons learned with a proof-of-concept system could be shared with others in the L10n industry and possibly be transferred to other non-localization parts of their organizations. It would be a clear win for everyone.

TAUS, the language data network, is an independent and neutral industry organization. We develop communities through a program of events and online user groups and by sharing knowledge, metrics and data that help all stakeholders in the translation industry develop a better service. We provide data services to buyers and providers of language and translation services.

The shared knowledge and data help TAUS members decide on effective localization strategies. The metrics support more efficient processes and the normalization of quality evaluation. The data lead to improved translation automation.

TAUS develops APIs that give members access to services like DQF, the Quality Dashboard and the TAUS Data Market through their own translation platforms and tools. TAUS metrics and data are already built in to most of the major translation technologies.

For more information about TAUS, please visit: https://www.taus.net