Annotation and its application to information research in economic intelligence

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Abstract: Annotation tools are becoming increasingly important in information research, information management and collaborative works. Annotation can be conceptualized to assist in the "collection, processing and distributing of useful information for the economic actors" (Economic intelligence) with the aim of facilitating the integration of two fields of information systems and decision making. This paper described the theory and concept of applying annotation in the process of information research for decision making. The specificities of this concept were compared to other concepts behind other annotation tools. Our study considered annotation in the light of three parameters of document, user and time. We observed that (a) different document requires different annotation; (b) two or more users may not make the same type of annotation on the same document (c) a specific user may not annotate the same document the same way at different time. Information research for decision making integrating an annotation database can be founded on these three parameters.

Key words: Annotation, economic intelligence, information research, document

1. Introduction

Annotation tools are becoming increasingly important in information management and collaborative works. Internet technology, which is one of the most outstanding platform for today's communication is favouring the use of annotation tools to resolve informational problems. Several free annotation tools are available for co-operative work and for personal employment. Some of these tools were developed based on specific local needs other were developed to cater for a generalized application. We believe that annotation tool can be conceived based on a concept that will permit its exploitation.

One of the objectives of annotation is to evaluate the content of a document. This content is nothing but the information contained in a document. Information is valuable possession. The value attributed to and/or perceived from document containing information is never zero. The value may depend on economic considerations, political factors, access to other related information and other socio-ecological factors.

2. Annotation parameters

An annotation is essentially consisting of three main components; the annotator (person making the annotation), the document being annotated and the resulting annotation itself. We will not give attention to the annotator in this study because our concern here is not on user modeling or profiling. We will consider a document as *"a trace of human activities"* (Prie, 1999, 23). In another word, a document is an attestation of human activities. A document may attest to cultural, historic, social, political, scientific, religious or biological events at a place or several places at a point in time. Document is not just paper or electronic media with information content.

If a piece of paper contains some writings on it, we consider that piece of paper as a document. If two pieces of clothes, one from India, the other one from Mali are presented before us, we may be able to say, one cloth is from India, while the other is from Mali. In

other word, we can infer from the pieces of clothes, some cultural heritages of Mali and India. This means that the pieces of clothes are medium of information.

Be it an architectural master piece, a sculpture, food items, drawings or musical instruments, a document contains information. Documents essentially contain information meant for interpretation (read, viewed, heard and perceived) by a certain group of people. The audience may or may not be pre-determined. It is therefore imperative that a document be made available to its potential audience. A document may be in oral, graphics or text form. It may be tangible or intangible. Henceforth, we will refer to documents as objects and vise-versa.

Annotation is an action and an object. From the perspective of an action, annotation can be defined as an act of interpreting a document. The interpretation is in a specific context expressed on a host document. The interpretation can be made by the producer of the document or another person. Considering it as an object, annotation is a written, oral or graphic document usually attached to the host document. The host document is the interpreted document.

Annotation can not take place until after the host document has been completed. It is therefore not a property of the original document. For instance, a plate number of a vehicle is not an annotation though it is attached to the document (vehicle). This is because, we consider a plate number as a property of a vehicle. A vehicle can not be said to be completed without a plate number. "A document in the making" is generally not considered for annotation. Every annotation on incomplete document is considered as part of the initial document. Annotations will normally take a different appearance with respect to the original document. The difference in appearance may be noticeable in form of character used, font, style, colour or additional signs and images that is not characteristic of the original document.

In a textual document, a document for annotation can include various entities like punctuations, words, images, artefacts terminologies, phrases, sentences, passages, collection of homogeneous documents or a collection of heterogeneous documents. These entities can reflect the granularity of annotation on the document. A collection of articles can be considered as a collection of homogeneous documents. This is because we can consider each of the articles in that collection separately each related to other articles uniformly in properties. A multimedia document can be seen as a collection of heterogeneous documents in the sense that individual member that form this collection may differ in their properties and features.

3. Annotation in economic intelligence

The word economic intelligence has to do with the use of information for strategic decision making. It is a process covering two fields of information systems and decision making (David et al 2001). Economic intelligence is defined as *"all the coordinated actions of collection, processing and distributing of useful information for the economic actors with the aim of its exploitation. These actions are taken legally with all the guarantees of protection necessary for the conversation of the company's patrimony, in the best conditions of quality, of delay and of cost"* (Martre, 1994).

From the perspective of economic intelligence (EI) study, it is the view of considering information system as a tool for a decision maker to make the best decision as regards to a particular problem of interest. Attention is given to human actors in EI. Two actors of importance are the decision maker and the watcher (Robert, 2003). These actors perform complementary activities to resolve decisional problems. It is of our interest to see how some of these activities can be performed with the help of annotation.

Most annotation tools available today were conceived without due consideration of neither user nor time. The attention given to document in most annotation tools were either

based on the medium or the content of the document (Ovsiannikov , 1999), (Denoue 2000). Some tools were concerned with the convenience of web technology and its applicability to annotation (Yee, 2002), (Sudhir, 2005). Others were concerned with information sharing and collaboration (Heck, 1999). The attention of DEEP Annotation system was on ontology instantiation (Handschuh, 2003).

	Annotation context	Fixed parameters			Representation
		User	Doc	Time	
1	All annotations on all documents by all users				$\iiint dUdDdT$
2	All annotations by all users on all documents at a specific time			X	$T\iint dUdD$
3	All annotations by all users on a document		X		$D\iint dUdT$
4	All annotations by all users on a document at a time specific		X	X	$DT\int dU$
5	All annotations by a user on all documents all time	X			$U\iint dDdT$
6	All annotations by a user on all documents at a specific time	X		X	$UT\int dD$
7	All annotations by a user on a document all the time	X	X		$UD\int dT$
8	All annotations by a user on a document at a specific time	X	X	X	UDT

Table 1: Table of annotation context

Our approach is to present annotation as a function of the host document, the user and the time involved in the annotation. We observed that (a) different document requires different annotation. (b) two individuals will not necessarily make the same kind of annotation on the same document (c) under normal condition, the same user will not annotate the same document the same way at different time. A document may be annotated several times by a particular individual. Several documents can be annotated by a user at a point in time or in a period of time. One user will annotate a document different from another user. A particular user may annotate the same document differently given a time frame. In applying annotation tool into economic intelligence, we are considering annotation in terms of time, users and documents. Series of annotations over time on one or more documents, by one or more users can be used to evaluate the orientation and interest of individuals as they attempt to resolve a problem of interest. These problems are generally in the form of using information to resolve a problem related to decision making in the course of economic intelligence.

An annotation or a set of annotation can be represented as

$$\iiint_x dUdTdD$$

Where dU is the change in user parameter, dT and dD are the changes in time and documents parameters respectively. Specifically, we are signifying that annotation can be seen as a function of user (**U**), time (**T**) and document (**D**).

One or more of these parameters can be kept constant while the others are varied as in table 1. The three parameters when kept constant refer to a single case of an annotation. In the case where all these vary, it imply every possible annotation on a set of documents of interest.

We can be interested in the annotations made by a particular user on a particular document over time. The objective of this may be to see his reaction or the user's disposition to an event. We can represent this as

$$UD \int dT$$

We can represent this in a three dimensional graph with each of the parameters in X, Y and Z axis respectively or with a table as in *Table 1*.

Application in economic intelligence

A production manager in a bottling company may be interested in the marketing of *Lemonade*. We can collect comment (annotations) made by the sales manager on "sales report". Here, we consider "sales report" as a document. The annotations of the sales manager can reveal several factors involved in sales of *Lemonade*. His comments will depict factors that affect sales at each point in time. If there is a sharp drop in sales, it may be as a result a particular event that was remarked (annotated) by the sales manager in a *particular* annual general meeting (UDT). The document may be fixed (sales report) and the user fixed (the sales manager), but the time not fixed (UD$\int dT$). We can expand the scope of annotations to other parameters of managers, documents and over a period of time. The drop in sales can be as a result of *a particular* event that was remarked (annotated) by all the managers in *a particular meeting* DT$\int dU$. The drop can be a cumulative effect of each of the *several reported* comments (annotations) of the *sales manager* on a report he consistently but diversely presented in *several meetings* (UD$\int dT$). We may look beyond the comments of the sales manager and consider the comments of *every stake-holder* on *sales report in meetings* (D$\iint dUdT$). Lastly it could the comments (annotation) of everyone on all reports (documents) all the time ($\iiint dUdDdT$). Analysis of these annotations can be used to resolve problems relating to drop in sales of *Lemonade*.

4. Perspective

We have considered annotation as a function of user, time and document. It may be interesting to look at these parameters in their subdivisions. For example, do we consider time in its totality or from what point to what point in time will be needed to resolve a problem? Will it be necessary to consider all annotations by a user knowing fully well that some annotations will fall out of our time frame of consideration? How do we fragment or group documents and time? In some cases, we may need the annotation of more than one user, what criteria do we use to group users?

This study presented a review with some illustrative examples of the use of annotation. We hope that these illustrations of annotation in economic intelligence can be adapted to a wide range of potential applications in both personal and collaborative contexts.

5. Conclusions

The concept of annotation was defined as object and action in a manner to isolate other confusing terminologies. This study proposed a set of direction and application of annotation that can forms part of a useful definition of 'annotation' in the context of economic intelligence.

The importance of annotation to economic intelligence was illustrated by providing detail examples. A practical application of this consideration is on course with the use of bibliographic database of a research group SITE[1] in LORIA[2].

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[1] *SITE is a research group in LORIA that is concerned with economic intelligence modelling. http://site.loria.fr*
SITE bibliographic database can be located at http://metiore.loria.fr
[2] *LORIA (Laboratoire Lorrain de Recherche en Informatique et ses Applications) http://www.loria.fr*

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