Study of Annotation Systems in E-business: Classification and Observation

Charradi Nesrine, Anis Kalboussi and Ahmed Hadj Kacem

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Abstract—With the advent of web 2.0, user-centric, consumers are increasingly becoming producers of information. He can express his opinions on the monetary exchange of goods, services and information through annotations. This annotative activity takes many different forms and is used for many different functions. In the literature, many tools have been developed to annotate various products and services. Even though this topic has already been partially studied by other researchers, the previous works have left some open issues. It concern essentially the lack of how to organize all the developed annotation systems in e-business .This problem is mainly due to the fact that annotation systems have only been developed for specific purposes. As a result, there is only a fragmentary picture of these annotation tools in the e-business domain. Therefore, we present a classification of forty annotation tools developed by industry and academia. This organization of annotation tools is built on the basis of four generic criteria and the features that they offer. From these two classifications, we present our observations and the limits of these systems.

I. INTRODUCTION

"The consumer is king" this simple sentence summarizes the importance of consumers in an e-business environment. With the advent of web 2.0, consumer roles in e-business have changed significantly. The consumer is increasingly becoming a producer of information. An annotation is one of the means enabling consumers to freely express their opinions and their satisfactions with the monetary exchange of goods, services and information. Consumer annotations are a reliable source of information for the potential consumer [1]. In recent years, annotations have become much democratized. They become a natural reflex for any buyer looking for a product or service[2]. Studies show that consumers have very high confidence in the annotations left by other consumers [3].

Annotations become important additional information in addition to the product description, expert annotations, and system recommendations[4] . Based on a survey[5], 87% of customers will read at least 10 reviews before deciding to buy a product. Various studies show that annotations have a positive impact on book sales[6] , cinema admissions[7] and restaurant revenues[8].

This annotative activity is carried out by systems specially developed to annotate the products or services of an online business site. Amazon.com was one of the first platforms to offer this kind of system since 1994, and today no market for goods and services is immune to this new form of evaluation[9]. Amazon.com encourages consumers to annotate products, and now has more than 10 million consumer reviews in all product categories on its website. Amazon's product annotations are very popular and are considered one of the most effective features of the site [10] .

In the literature, many tools have been developed to annotate various products and services.As a result, there is only a fragmentary picture of these annotation tools with its classifications and features.

The aim of the article is to provide a unified and integrated picture of annotation systems in e-business. This panoramic view is based on a classification of forty (40) annotation systems developed in literature by industry and academia. This organization of annotation systems is first of all built on the basis of four generic criteria [11]: annotation type (computational/cognitive); category of annotation system (application/plug-in/web site); type of annotative activity (manual/semi-automatic/automatic)and annotated resource type. A second comparison is made on the basis of the features offered by the e-business annotation systems. This paper is organized as follows: Sect. 2 gives a general presentation of the annotation systems and a classification of these tools based on several criteria; Sect. 3 draws some key observations and a discussion of open research problems on annotation systems. Finally Sect. 4 concludes this article.

II. CONSUMER ANNOTATION AND E-BUSINESS ANNOTATION SYSTEMS

A. Definition of Consumer Annotation and E-business Annotation Systems

In the literature, there is no consensual definition, there are several different definitions of annotation, but they agree that annotation is an activity. Definitions differ depending on the research area.

In e-business, annotations can be defined as third party evaluation by consumer regarding of a product or service[5]. They are keywords, notes, etc. assigned by a consumer to a resource (product, service) based on their personal use experience. Annotations are posted on e-business sites on the side of the product description to improve the perception of other consumers [4].

Annotation systems allow users to annotate different types of digital resources with several types of annotations such as highlight, circle, explain, query, etc. which aims to enrich and add value to information. An annotation system or still called annotation tool or "annoteur", is a system allowing users to

annotate various types of electronic resources with different kinds of annotations[12] .

In e-business ,annotation systems allow consumers to annotate products or services, to express their opinions, etc. They help the merchant to measure and improve consumer satisfaction, identify dissatisfied consumers and obtain valuable information from buyers themselves.

We can find many annotation systems in an e-business context such as Amazon [13],ebay [14], TripAdvisor[15] ,Yelp[16] ,Flipkart [17],Trustpilot [18],Alibaba[19],Walmart [4], Booking.com[20] ,etc. (see Fig. 1).

Fig. 1: Several annotation systems in E-business.

B. Classification of annotation systems

In the literature the number of annotation systems in e-business does not stop increasing every year. As a result, there is only a fragmentary picture of these annotation tools with its classifications and features. To unify and integrate the picture of annotation systems in e-business environment, we present a classification of forty annotation tools developed in the literature by industry and academia.

This organization of annotation tools is built on the basis of four criteria.

Each annotation system should focus on a particular type of annotation. Afterwards, an annotation system can be one of three categories: (application/website/plug-in). For each category, the annotation system is necessarily based on a process of annotative activity (manual/semi-automatic/automatic) and annotates a particular digital resource type [11].

1) First Criterion: Annotation Type (Computational/Cognitive):

- **Cognitive annotation:** If the annotation is intended to be read and interpreted by the human agent, it is called "cognitive annotation", it must have a visible, perceptible and distinguishable form of the document which carries it. Cognitive annotations are considered as additional content that relates to an existing content, meaning that they increase the existing content by providing an additional layer of elucidation and explanation.

- **Computational annotation:** When the annotation is intended to be interpreted by a software agent, it is called "computational annotation". It is also often called metadata, that is, additional data which relate to an existing content and clarify its properties and semantics. It is used in the field of information retrieval, summarization, document classification, indexing etc.

2) Second Criterion: Category of Annotation System (Application/Plug-in/Web Site): Several annotation systems have been developed in the field of e-business to allow consumers to freely annotate the products and services available. These annotation systems can be classified in three main categories (see Fig.2).

- **Plug-in annotation:** These are extension modules or also called additional module which are added to a website in order to provide annotation functionalities to them. We can distinguish two sub-types:
  - The plug-in which is already integrated into e-business sites such as Amazon[13], Alibaba[19], Flipkart[17], Ebay[14], etc. Which are allocated to consumers to annotate the products available on each web site.
  - The second sub-type are additional modules that can be integrated into our e-business site such as Bazaarvoice[21], PowerReviews[22] ,etc.

- **Web-site annotation (annotation service):** It is a specialized annotation website that allows its users to annotate other e-business websites. We quote in this type of annotation system: ReviewCentre [23], Reseller ratings[24] , Reddit [25], CritLink[26] , Share-Me [27],Trustpilot [18], etc.

- **Annotation application:** An application is created which allows its users to annotate the resources consulted. CASAM [28], Marky[29] , Memory Specs [30] etc. are examples of annotation application.
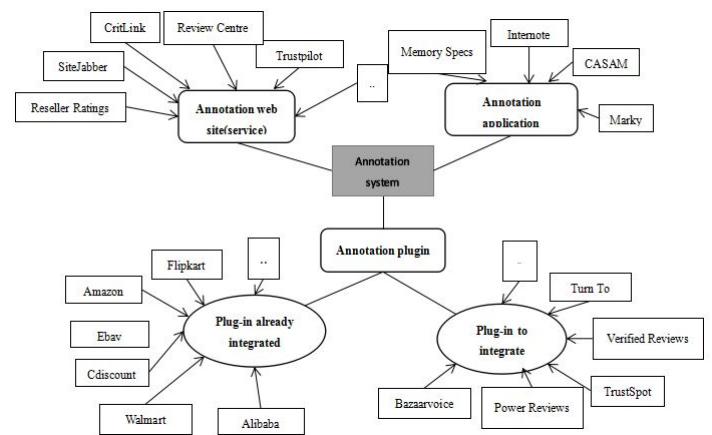

Fig. 2: Category of annotation system (Application/Plug-in/Website).

3) Third Criterion: Type of the Annotative Activity (Manual/Semi-Automatic/Automatic): Any process of annotative activity necessarily goes through two sub-processes: choose the anchor and the shape of the annotation in a given resource (sub-process 1) and specify the properties of the annotation (sub-process 2). Based on these sub- processes, we can classify the annotative activity as: manual, semi-automatic or automatic[31] .

- **Manual:** This is the annotation that is carried out by the consumer himself, he selects the form of the annotation and anchors it then creates the annotation. This process is similar to the process of annotation when a paper support is available.

- **Semi-automatic:** First of all the consumer begins to annotate manually and in parallel the tool analyzes its annotations and generates the annotation rules. Then, the system offers a suggestion of automated annotations, based on an annotation model built with rules under development. Finally, the consumer can validate or not the annotations proposed by the system.

- **Automatic:** The annotation process is performed only by the machine. It's the annotation tool that selects the form and anchor of the annotation. These annotations are based on either context sensors or pattern recognition techniques, etc.

4) Fourth Criterion: Type of Annotated Resources: Through the annotations systems, annotators consult and annotate varied electronic resources. Such a resource is dematerialized in a particular format: Text, HTML, Video, Image, Audio and URL.

Table I presents a comparative study of the e-business annotation systems seen in the bibliographical study using the 4 criteria already explained.

C. Features of Annotation Systems in E-business

In this section, we have mentioned some features provided by annotation systems. We have focused on the most important features.

- **Manage annotation:**
  - Create annotation:creating annotation can be automatic, manually or semi-automatic. However in the e-business field the manual annotation is much used.
  - Modify annotation: with this function we can modify our annotation.
  - Delete annotation: deleting annotation without archiving.
  - Annotation display: All annotations are displayed, each consumer can see them.
  - Saving annotation: this function offers the possibilities to record this annotation in a form specified by the constructor of the system.

- **Moderation of annotations:** moderation of annotations consists in analyzing the different annotations of consumers. Once the annotations have been identified, it is important to analyze them and decide whether to accept or to reject this annotation.

- **Request an annotation:** the annotations left on e-business web sites occupy an increasingly important place in the purchase decision. Annotation systems use this feature to encourage consumers to annotate products and express their opinions. There are different tools used to get more annotation for example with e-mail.

- **Questions and Answers(Q&A):** one of the many additional features included in annotation system plans . Q&A is a feature that allows consumer to ask questions regarding a specific product. It is a powerful feature that allows site owners and other consumers to answer questions. It ceases to be a simple Q&A type framework to become a space for listening and exchange which allows us to be closer to the consumer and get to know them better.

- **Respond to negative annotations:** most annotation systems choose to respond to all negative annotation without deleting them.

- **Sentiment analysis:** is defined as the process of mining of data, view, review or sentence to predict the emotion of the sentence through natural language processing (NLP). This machine learning tool can provide insights by automatically analyzing consumer annotation and separating them into annotation: Positive, Neutral, and Negative [32].

- **Annotation sharing:** there are annotation systems that allow you to share consumer annotations via social networks like Facebook, Instagram, twitter, etc. or even via emails. Several annotation systems use this technique such as trustpilot, verified Reviews, feefo, yelp, etc.

Table II presents a comparative study of the e-business annotation systems seen in the literature review using the features offered by each system as a comparison criterion.

Name of annotation system	Year	Type of Annotation System			Annotation Type		Data Annotation	Type of Annotative Activity		
		Plug-in	Website	Application	Cognitive	Computational		Manual	Automatic	Semi-Automatic
Amazon	1994	✓			✓		Text, Image	✓		
Ebay	1995	✓			✓		Text, Image	✓		
Reseller Ratings	1996		✓		✓		URL	✓		
Booking.com	1996	✓			✓		Text, Image	✓		
CritLink	1997		✓		✓		Doc, HTML	✓		
Cdiscount	1998	✓			✓		Text, Image	✓		
TrustedShops	1999		✓		✓		URL	✓		
Consumersearch.com	1999		✓		✓		URL	✓		
Review centre	1999		✓		✓		URL	✓		
Alibaba	1999	✓			✓		Text, Image	✓		
Fnac	1999	✓			✓		Text, Image	✓		
MouthShut.com	2000		✓		✓		URL,Text	✓		
TripAdvisor	2000		✓		✓		Text, Image	✓		
Walmart	2000	✓			✓		Text, Image	✓		
Yelp	2004		✓		✓		URL	✓		
Shopzilla.com	2004		✓		✓		Text, Image	✓		
Bazaarvoice	2005	✓			✓		Text, Image	✓		
PowerReview	2005	✓			✓		Text, Image	✓		
eKomi	2005	✓			✓		Text, Image	✓		
Flipkart	2007	✓			✓		Text, Image	✓		
TestFreaks	2007		✓		✓		URL	✓		
Trustpilot	2007		✓		✓		URL	✓		
TurnTo	2007	✓			✓		Text, Image	✓		
TrustSpot	2007	✓			✓		Text, Image	✓		
Feefo	2010	✓			✓		Text, Image	✓		
Shopper Approved	2010	✓			✓		Text, Image	✓		
AliExpress	2010	✓			✓		Text, Image	✓		
Yotpo	2011	✓			✓		Text, Image	✓		
Verified Review	2012	✓			✓		Text, Image	✓		
Share-me	2013		✓			✓	Doc	✓		
Reddit	2014		✓			✓	URL	✓		
Memory Specs	2014			✓		✓	Text			✓
Marky	2014			✓		✓	All types			✓
CASAM	2014			✓	✓		Video			✓
Lipscore	2014	✓			✓		Text, Image	✓		
Framework ASVA	2014			✓		✓	Video		✓	
Judge.me	2015	✓			✓		Text, Image	✓		
tagalys	2015	✓				✓	Image		✓	
Starfish Reviews	2017	✓			✓		Text, Image	✓		
dataturks	2018			✓		✓	Image		✓	

TABLE I: Classification of e-business annotation system based on four criteria

Name of annotation system	Manage	Moderation	Sentiment Analysis	Request	Sharing	Respond	Q&A
Amazon	✓	✓	✓	✓	✓	✓	✓
Ebay	✓	✓	✓		✓	✓	✓
Reseller Ratings	✓	✓	✓	✓		✓	✓
Booking.com	✓	✓	✓		✓	✓	✓
CritLink	✓						
Cdiscount	✓	✓	✓		✓	✓	✓
TrustedShops	✓	✓		✓	✓	✓	
Consumersearch.com	✓		✓				
Review centre	✓	✓	✓		✓	✓	✓
Alibaba	✓	✓	✓		✓	✓	✓
Fnac	✓	✓	✓	✓	✓	✓	✓
MouthShut.com	✓	✓	✓				
TripAdvisor	✓	✓	✓	✓	✓	✓	✓
Walmart	✓	✓	✓		✓	✓	✓
Yelp	✓	✓	✓		✓	✓	✓
Shopzilla.com	✓						
Bazaarvoice	✓	✓		✓	✓	✓	✓
PowerReview	✓	✓		✓			✓
eKomi	✓	✓		✓			
Flipkart	✓	✓	✓			✓	✓
TestFreaks	✓	✓	✓			✓	✓
Trustpilot	✓	✓	✓	✓	✓	✓	✓
TurnTo	✓	✓	✓	✓		✓	✓
TrustSpot	✓	✓	✓	✓	✓	✓	✓
Feefo	✓	✓	✓		✓	✓	✓
Shopper Approved	✓	✓		✓	✓	✓	
AliExpress	✓	✓	✓			✓	✓
Yotpo	✓	✓	✓	✓	✓	✓	✓
Verified Review	✓	✓	✓	✓	✓	✓	
Share-me	✓				✓		
Reddit	✓		✓				
Memory Specs	✓						
Marky	✓						
CASAM	✓						
Lipscore	✓	✓		✓	✓	✓	
Framework ASVA	✓						
Judge.me	✓	✓		✓			
tagalys	✓						
Starfish Reviews	✓	✓		✓	✓		
dataturks	✓						

TABLE II: Classification of e-business annotation system based on features

III. Observation and Limitation

From the study of the annotation systems in e-business, we can synthesize some observations and limitations presented as follows:

- **Synthesis 1**

  According to our bibliographic study of a set of annotation systems offered by websites or e-business platforms for consumers in order to annotate the products and services displayed, it seems that the majority of these systems share the same functionality mainly aimed at creating new annotations, viewing existing annotations by considering the formatting styles, managing the storage of annotations, share annotations between user groups, etc. All of these systems have an objective purpose. No system focuses on analyzing consumer behavior(which is a subjective purpose).While, we must insist that the analysis of consumer behavior is a key aspect for the success of an e-business[33].The study of consumer behaviour allows us to answer several questions: how does the consumer think and feel about this product? When does a consumer search for a product to buy and make purchases, what behavior is adopted? If we talk about the e-business environment, we are in fact talking about thousands of products, brands, services, etc. how does the consumer reason and choose between these different alternatives? Another question which is very important, to what extent is the behavior of the consumer influenced by its environment (entourage, culture, media)?

- **Synthesis 2**

  Another very important point concerns the credibility of the consumer annotation. There are annotation systems which explicitly ask consumers to write an annotation, for example, by sending emails (this is the standard way used by brands to request comments). This way can bother the consumer a lot because of the effort involved. The relevance of the annotation system depends on the degree of involvement. But this method induces a lack of interest on the part of the consumer, which results in a deterioration in the efficiency of the system. Even if he writes a annotation, he may not express his real opinion. So whenever the consumer feels that he is not free , he is likely to provide incomplete or incorrect annotations. the consumer must be inspired to talk about their experience, without being prompted by someone else.

- **Synthesis 3**

  The annotative activity in e-business environment can be manual, semi-automatic or automatic. According to the comparison of the annotation systems(see tab. I) and as it shows in fig.3 we concentrated on manual annotation. But that does not exclude talking about the importance of automatic annotation which is widely used by large e-business sites like Amazon, Ebay, Alibaba, Walmart, etc. So this type of annotation is used by the machine to annotate the available products. With the explosive growth of e-business products sold online and heterogeneous categories, it has become physically impossible to manually annotate the products. Besides not everyone will annotate the same images of products with the same annotation. This leads to discrepancy in the kinds of annotation allotted to the products,and then many useful research results are excluded. An automatic annotation system can help solve these two problems [34].
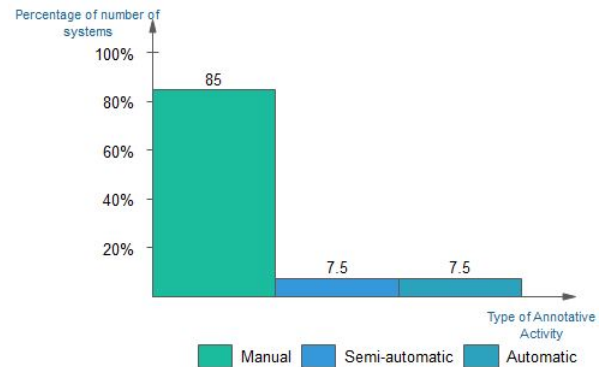

Fig. 3: Percentage of each annotative activity

- **Synthesis 4**

  Consumer annotations, positive or negative, are considered an important source of information for potential consumers.It has been observed that negative annotation occurs three times less than positive annotation[35] but customers tend to be more affected by negative annotation [36]. Also, previous research discovered that negative annotation have a negative impact on consumers.From the study of the features of annotation systems (see tab.II), we observe that there are systems that have chosen to respond to negative annotation, such as Trustpilot, Amazon, Ebay,ect, because the merchant's response on negative annotations could moderate the negative effect to certain extent[37].

- **Synthesis 5**

  The presented list of annotation systems is not exhaustive, but it contains the majority of annotation systems encountered in our survey of annotation tools in e-business. Nevertheless, the outcome of this article has been limited by the inadequate information about the annotation systems that were discussed. Some of the systems are open source; therefore it is possible to study its documentation and code to explore the structure. However, for many of the other systems, it is very difficult, if not impossible, to get to know their strategies of implementation.

IV. Conclusion

Based on an overview of existing annotation systems, both in research and industry, this article proposes a unified and integrated picture of annotation systems in e-business. This panoramic view is based on a classification of forty annotation systems developed in the literature by industry and academia. This organization of annotation tools is built firstly on the basis of four criteria: annotation type (computational/cognitive); category of annotation system (application/plug-in/web site); type of annotative activity (manual/semi-automatic/automatic) and type of annotated resource (text/web page/video/image/HTML). In a second time we studied these systems by detailing the features offered by the systems, and other features already seen in the literature. We ended this article by listing the observations and limitations of these systems. In future research, we will aim to reach a thorough understanding of the implementation and structure of the annotation systems. These tools studied above are necessarily based on annotation models to conceptualize their properties in a formal way to be exploited by computer systems. Thus, we are also planning to propose a survey of conceptual annotation models in e-business.

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