Business Impact of Online Institutional Recommendation

Mihaela Ion and Regis Saint-Paul

CREATE-NET International Research Center
Via alla Cascata 56D, 38123 Trento, Italy
{Mihaela.Ion,Regis.Saint-Paul}@CREATE-NET.org

Abstract. Institutional recommendation is an important factor for building trust in business or social interactions. Institutional ratings are issued by trusted authorities such as public bodies or reference publications. They assess people's expertise, the quality of products or services or the economic health of companies among other. Institutional ratings are characterized by objective and repeatable evaluations, based on well defined criteria and issued by institutions that build their own reputation on the quality of their assessment. However, on the Internet today, they lack adequate support that would encourage their usage and allow them to play a role as significant as they already have in off-line relationships. This article presents the potential of transposing existing institutional recommendation mechanisms on the Internet and describes new business models and scenarios that could be enabled.

Keywords: Institutional trust, rating agency, rating, business models.

1 Introduction

Any business transaction requires some level of trust between its participants. For instance, a buyer needs to trust a seller that the goods on sell have the advertised quality and that they will be delivered timely. Such a trust relationship might be established by a variety of means including past experience or exchange of documents. The final decision of whether to trust is also influenced by the specific risks involved in the transaction and the participant's own aversion to risk.

On the Internet, most of the times, the parties involved in a transaction have no or little information about each other. Hence, trust building mechanisms became a necessity for the success of online transactions and various mechanisms have been studied and proposed [1]. Usually, trust between participants that do not know each other directly is built through recommendations or ratings from third parties.

Two main approaches can be distinguished here, depending on the source and nature of the recommendation. An approach called "social recommendation", epitome of the Web 2.0 area, consists of relying on fellow customers (peers) to make informed decision about a product (e.g., Amazon) or about a seller (e.g., e-Bay). Another approach, which is the focus of this paper, is to refer to specialized institutions for assessing products, services or their brokers.

For example, investors can refer to financial rating agencies to estimate the risks and future yields of an investment; photography enthusiasts may rely on extensive

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camera reviews in photography magazines to make informed buying decisions; and consumers of "bio" products implicitly delegate to specialized agencies the task of verifying that food producers abide to the requirement of "bio" label. Degrees, certificates and awards are yet other forms of evidences that can help establish a trust relationship between parties.

In the remainder of this paper, we will collectively refer to these forms of rating, labeling or certification as "Institutional Rating" or "Institutional Recommendation" (IR for short) and institutions issuing such recommendations will be referred to as "Rating Agencies" (RA for short).

By contrast with social recommendation, IR emphasizes *objectivity* and *repeatability* of the recommendation [2]. A set of well defined criteria, sometimes measurable, are used to sustain the claim of objectivity of the rating. An aggregated recommendation (e.g., a number of "stars") may also be provided to help digest all these criteria into a global rating intuitively intelligible to the user. For instance, hotels have to provide a minimal quality of service over a range of criteria to obtain a "five stars" label. RAs will therefore issue ratings for each of the reviewed entities. The issued rating is *unique*, meaning that for a given set of criteria and a given entity, objectivity would lead to a same rating (e.g., a hotel cannot be at the same time 3 and 4 star). However, a same RA may provide multiple ratings to a same entity as long as their criteria and semantic are different (e.g., an RA may rate the hotel restaurant in a way and the hotel rooms in another). Moreover, ratings often have limited validity, reflecting the expected variability in time of the corresponding market.

IR is complementary to other forms of recommendation and, in some cases, has no equivalent. For example, someone's legitimacy to practice medicine cannot (and probably should not) be assessed by ways of social recommendation. Assessing certain criteria may also require access to information not available to the general public (e.g., access to production facility for "bio" labeling).

The above examples show the key role plaid by IR in traditional business. However, on the Internet today, social recommendation is largely predominating and IR is still carried out using "off line" mechanisms (e.g., paper documents).

In this article, we examine social recommendation along several dimensions to highlight its shortcomings (Section 2). We then contrast these shortcomings with the characteristics of IR (Section 3). Our objectives are twofold. First, we wish to motivate IR as a most needed and complementary recommendation form to conduct online business. Second, we intend to characterize thereby a list of desired feature that online IR should present. On this basis, we summarize a possible model of online IR (Section 4) and outline the new business models and activities that could grow on top of such framework.

2 Limitations of Social Recommendation

Is a high definition camcorder better than a low definition one? Arguably, high definition is attractive for its enhanced image quality, in line with the latest television standard and therefore is better. On the other hand, low definition is attractive for it is less demanding in terms of storage space and its format is in line with the requirements of online video sharing. The lower price doesn't hurt either.

Leave the recommendation to online buyers and expect a heated debate on the pluses and minuses of each model. Depending on the website gathering user recommendations, ranking of the goods may also be mixed with the user's overall satisfaction about the transaction (e.g., delay on the delivery, packaging problems due to transport, etc.) and biased appreciation of one's own choice.

This small example illustrates one of the issues faced by product recommendation based on feedback, also termed the "*word of mouth*" approach [3]. In the following, we briefly review some of the critical issues raised by social recommendation. Our aim is not a comprehensive survey of these issues, which form an active research domain, but rather to outline the main motivation for an alternative approach based on institutional recommendation which, at least partially, answers to these issues.

***Scope of application*:** Social recommendation is inherently limited to the qualities publicly accessible to users, either through the usage of a service or good, or through their existing relationship with a company or person. This excludes complex assessment (e.g., Does Company A abide to EU environmental recommendation?) or assessment based on evidences which are not part of the relation (e.g., Does company A manufacturing process comply with personal ethic?). While such questions are relevant to the user's trust in company A, the user will not be able to provide feedback about them.

***Method and quality of measure*:** The collection of social recommendation may be implicit (e.g., google through site cross-linking) or explicit (e.g., e-Bay). Both approaches have drawbacks: in the implicit approach, feedback gathering can be distributed (any user building a website is at the same time providing a recommendation) however, the feedback is then very poorly qualified (the linked site might be so equally for critic or appraisal). Therefore, implicit gathering mainly measures popularity rather than intrinsic quality. On the other hand, web sites such as eBay ask users to provide feedback by choosing between negative or positive recommendation (or any intermediate appraisal level) and even publish guidelines on how to evaluate. However, the feedback provided is typically subjective and can lead to unfair rating due to a mixing of the criteria (see our introductory example) or malevolent behavior (e.g., discriminatory ranking) [4]. Genuine users might also provide improper rating due to the lack of perspective on the topic (they might know just a single product, the purchased one, and are not able to perform comparisons). Moreover, social recommendation is sensitive to a number of threats such as collusion attacks [5] in which a coalition of actors agree on fake recommendation to artificially raise their ranking or Sybil attacks [6] in which one entity creates multiple identities to increase the reputation of one identity.

***Dynamics of the recommendation*:** Effective recommendation based on feedback necessitates a long term relationship between the market actors for allowing the time to collect feedback. This raises the question of how new entrant can gain initial reputation (cold start problem). Feedback-based recommendation might also be a measure of popularity rather than intrinsic quality (e.g., google pagerank). As a popularity metric, it behave in a dynamic way similar to fashion or vogues. Feedback-based evaluation operates continuously, either aggregating the feedback over some time-window or considering the entire feedback history. A difficulty in this case is to

match the time window considered and the volume of feedback received with the dynamics of the quality of the service or institution being ranked. For instance, if an ISP quality of service is good at some point and leads to positive feedback, it will take a long time to update the reputation of the provider to reflect a change in the quality of service in case of a sudden drop.

***Provisioning to third party*:** Social recommendation is the by-product of the participation of users into a virtual community. Feedback is perceived as a way to serve the community and is typically provided only on the web site that supports the community. For example, e-Bay feedback about a seller or Amazon reviews can only be seen by visiting e-Bay or Amazon respectively. This limits the effectiveness of the recommendation to serve in trust establishment between parties that enter in relationships outside of this recommendation domain.

3 Institutional Recommendations

In this section, we present how traditional mechanisms of institutional recommendation address the issues listed above regarding social recommendation. We note that a number of the benefits of IR are linked to their essentially "off-line" nature. Therefore, we present in Section 4 a generic framework that would allow bringing these beneficial off-line features to the online world.

3.1 Existing Forms of Institutional Recommendation

IR covers a wide range of business and legal activities. It can be defined as "a professional assessment carried out by a clearly identified institution (public or private) or its representatives as the result of an examination process". The examination process implies that the assessment is not generated in an ad-hoc fashion but relies on some (semi-)formal methodology. Here are few examples of IR: Product certification (e.g., aircraft flightworthiness, MS Windows compatibility), Professional or academic certification (e.g., diploma), Homologation, Professional review (e.g., camera test by a professional publication, edited restaurant guides).

Sometimes, a clear-cut distinction between institutional and social recommendation can be hard to make. For instance, restaurant reviews and ranking can be carried out by paid professional journalists who visit the restaurants. However, any such publication also receives feedback from its readership that might be incorporated, updating the review. We would still qualify a published restaurant guide as an institutional recommendation because the guide puts it credibility at stake when publishing a ranking. Therefore, it is in the guide interest to carefully edit consumer's feedback prior to their inclusion so as not to undermine the perceived authority of the publication on the matter. From this example, we can see that institutional recommendation can also be characterized by contrast with social recommendation:

***Scope of application*:** Institutional recommendation is carried out as a distinct activity from the product or service consumption. Therefore, it is not bound in its scope to assessing only "visible" qualities generally accessible. When the evaluation is carried as part of a legal process (e.g., homologation, certification), there is virtually no limits

to the range of data accessible to evaluators. When it is carried out by recognized institutions as part of a publication effort, the marketing impact of a good evaluation is often a strong motivation for companies to open their process to journalist's investigation.

***Methods and quality of measures*:** The criteria used in institutional recommendation are at least semi-formalized through a series of guidelines, requirements or protocols. The same criteria are used to assess a large number of entities. The process may range from strictly formal (aerospace certification) to more or less formal (diploma) down to poorly formal (restaurant ranking). However, even in this later case, some measure of repeatability can be achieved by relying on the experience of professional reviewers and by repeating the evaluation. The institution performing the ranking also places its reputation at stake, which is a strong driver of quality. Note that this does not prevent errors or malevolent behavior, with threats including conflict of interest (e.g., review magazine where the reviewed product manufacturer is also an announcer in the magazine) or sheer incompetence (e.g., financial rating agencies who rated AAA US mortgage derivatives).

***Dynamics of the recommendation*:** Several business models are possible for institutional ranking. Often, the ranked institution or person may pay a fee for obtaining the assessment (e.g., professional certification, product homologation, etc.). Most of the models avoid the cold-start issue of recommendation based on feedback. The recommendation life-cycle often presents a clear renewal mechanism, either based on validity limits (e.g., driver license) or on periodic reevaluation (e.g., restaurant guide). The periodic assessment is an integral part of most recommendation institution business models.

***Provisioning to third party*:** The assessment is necessarily issued by an identified institution with authority to this end. This authority might be informal (e.g., built over time, as with restaurant guides) or formal (legal), as is the case of a university issuing diplomas. Once delivered, the assessment can be claimed directly by its recipient (e.g., a restaurant might display the ranking at its door or a student can carry her diploma to an interview). The issuing institution might also allow access to the assessment (e.g., restaurant guide), but this access can be limited to verification purposes (e.g., university).

3.2 Requirements for e-Version of Existing Models

Currently on the Internet, ratings are displayed as logos of the RA on the rated Web site and users can click on the logo to check its validity. When clicking, users are typically redirected to the Web site of the institution that provided the rating or to some report issued by the specialist that evaluated the entity. This approach has several disadvantages:

1. The absence of standardized mechanisms for verifying ratings authenticity. The current approach has many security vulnerabilities related to Web redirection or phishing attacks. Indeed, it is as easier to fake a rating agency's Web site than to fake the rating itself;

2. The absence of a standardized access to rating schema (e.g., which features of the product are evaluated and how) makes difficult understanding some ratings, thereby limiting their usefulness;
3. Ratings cannot automatically be processed by applications. It might be useful to benefit from the ordering they introduce among entities to enhance user experience (e.g., filtering on products that satisfy a given norm);
4. Due to poor interoperability, ratings cannot be easily exchanged between RAs.

These issues highlight to two key requirements that a framework for institutional trust on the Internet would have to fulfill: (1) Propose a standard representation of the documents involved during interaction with institutional rating (that is, the ratings and their metadata); (2) Provide a standard mechanism for the authentication of these documents (including authentication of the RA's legitimacy to issue the certificate, of the entity's legitimacy to claim a rating, and of the criteria that were used for deriving a certain rating).

3.3 A Framework for Online Institutional Recommendation

In the light of above requirements, we have proposed a framework for the representation and exchange of institutional recommendation (and ratings). In this section, we recall its main feature and refer the reader to [7] for further details.

We chose to rely on existing security mechanisms, developed for the purpose of web-site authentication, in order to enable the certification of the documents involved in IR. Besides building on proven technology, an important benefit of such an approach is to speed-up the adoption of the IR framework by lowering the cost of deploying IR specific certification systems. We then introduce a number of documents which are keys to the IR domain:

***Identity certificate of the RA*:** Serves for verifying the identity of the issuing Rating Agency. Several certification standards bind an identity such as a pseudonym, web address or email address to a public key. The correctness of the identity-public key binding is certified by a Certificate Authority trusted by the user.

***Attribute certificate of the RA*:** An attribute certificate binds attribute-value pairs to a public key. Existing standards are flexible enough to support expressing any kind of attribute information. For example, an RA could be issued a certificate by a public body in a country that authorizes it to issue "bio" labels for a particular product in a certain region. Several standards support attribute certification.

***Rating schema (or rating metadata)*:** For a rating to be useful to a user, the user needs to understand what the rating means. It is the responsibility of RA to make available all the information needed to interpret its ratings: the type of entity to which the rating applies, the criteria used, and the rating process. The rating schema is meant to capture these information and this document is referenced by a rating to allow its interpretation. The rating schema might be defined by the RA itself or by a public body at a national level (e.g., bio labeling criteria).

Rating certificate: Based on the rating schema, an RA rates an entity and issues a document stating the rating achieved. In order to check the authenticity of the rating, the RA needs to cryptographically sign it with its private key. Because this document carries a signature, we call it a rating certificate. The attribute certificate standards described above are suitable for expressing the rating certificate. In particular, SAML is the most flexible and appropriate standard. SAML allows expressing any pairs of criterion-value because was designed to allow different industries to define attribute names and type of values in specific namespaces. Moreover, being XML based, ratings are easy to process, request and exchange by applications.

***Identity certificate of the entity*:** It is important to correctly link an entity with its rating. This can be achieved through a proper identification of the entity and a linking of the entity's identity with its rating. These are two challenges that need to be addressed in order to transpose IR on the Internet. Identifying any kind of entities like real world objects is an open research problem. Moreover, currently there is no binding of attribute and identity certificates. Public key infrastructure (PKI) standards recommend using a reference in the attribute certificate like the serial number of the identity certificate to which it refers.

4 Impact on Business Models

The availability of an electronic version of traditional IR (as, e.g., outlined in the previous section) is expected to induce modification of existing business models such as B2B and B2C. In particular, electronic and interoperable IR has the potential to create an online marketplace in which:

- Organizations belonging to a domain define their specific rating schema
- RAs rate entities based on well-known and standardized rating schema
- RAs could define schemas tailored for specific domains or categories of users
- Ratings are translated across geographical and organizational boundaries
- Consumers are able to make informed decisions about products and buy those that satisfy their needs better
- Consumers and vendors trust the market and the number of transactions increases

We will illustrate the above points through the example of foreign diploma recognition. Each school evaluates students and issues diplomas based on well-defined criteria, usually established at national level. Inside the same country, an employer can assess a job candidate fitness based on diploma owned because: (i) the employer trusts the school or the national body that accredited the school, and (ii) she is familiar with the rating criteria (number of years or national ranking of school). However, when presented a diploma issued in another country, possibly in a different language, and using different rating schema, the same employer will not be able to rely on the diploma for assessing the postulant. To cope with such situations, the employer might rely on a local body to verify the diploma and issue an equivalent one in the national system. Usually this consists of language translation, rating scale translation (e.g., 1-10 grades, 6-1 grades or A, B, C, D, F) and so on. To facilitate diploma recognition, countries establish agreements and each define a set of rules or mappings from foreign diplomas to their local ones.

With electronic IR, this tedious task can be sped up or avoided altogether. Instead of operating in disconnected fashion, the electronic representation and exchange of IR allows issuing agency to establish direct relationship between each other and to automate the process of translating RA with the following advantages:

- To allow users to consume and interpret ratings issued by unknown RAs.
- To enable trust in unknown RAs since the trustworthiness of the unknown RA is guaranteed by the local trusted RA. For example, a national agency providing labels for Bio product would be able to verify the criteria used by the national agency of another country. If these criteria are largely identical, each national agency can grant its peer a recognition allowing consumer of a country to confidently consume bio products certified in another country.
- To allows an RA to rate entities that are not in its geographical area (through the translation agreements mentioned above).
- To enables business relations between entities in different domains (e.g., for market makers operating on multiple markets).

5 Conclusions

Institutional ratings play an important role in off-line relations. They assess people's expertise, the quality of products or services or the economic health of companies among other. On the Internet, they are not supported properly and we see a need to transpose them to the online world. This paper provided a comparison of social and institutional ratings and showed where IR play an important role and cannot be substituted. We then proposed a framework for IR based on current certification technologies and discussed the new business models enabled by an online representation of IR documents.

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