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## Prioritizing Trust Factors in an Agri-Food B2B E-Commerce Environment

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### Abstract

Trust is recognized as an important asset for Business-to-Business e-commerce success, but few studies investigate the link between trust and e-commerce in agri-food markets. This paper aimed at prioritizing some trust factors in e-relationships between actors operating in the agri-food markets. Starting from the results of a previous analysis (Canavari *et al.*, 2005), the importance of three categories namely “share of values and motivations”, “reliability and reputation” and “integration availability and non-opportunistic behavior”, and six trust factors are prioritized using the Analytic Hierarchy Process. The model seems to be capable to assign a priority order to the elements inspiring trust within e-trade relationships in the agri-food chains.

**Keywords:** *Organizational Behavior (D23), e-Commerce (L81), Trust, analytic hierarchy process.*

### 1. Introduction

Despite the potential recognized to electronic commerce (EC), presently the adoption of this tool within the small and medium enterprises in the Italian agri-food system is still slow and diversified across industries (Fritz *et al.*, 2005; Canavari *et al.*, 2003).

Some elements proper of EC generate information asymmetry and lack of trust in this tool, such as the feeling of anonymity linked to spatial dispersion of the actors involved (De Carli, 1997), the mostly asynchronous communication (Castell, 2002) and the impossibility to directly inspect the object of the transaction (Schiefer and Rickert, 2004).

Trust represents a fundamental condition for both common and web-based trading relationships. Setting and managing solid trust links between enterprises in the same network represents an essential requirement to minimize complexity and risk in the competitive environment. In the agri-food system in general, and in specific industries in particular (e.g. fruit trade), trust between the operators is a hot issue and a key element of the business relationship.

The starting point of this paper is the hypothesis that the scarce penetration of EC instruments in the agri-food system is also due to the presently available EC technical solutions' low capacity to stimulate trust in these types of relationships.

If trust-effective solutions including trust-creating mechanisms could stimulate the

establishment of solid relationships (apart from already existing linkages), the potential advantages linked to the reduction of transaction costs could be better exploited.

A literature review reveals that there are few researcher that have studied the importance of some trust-keys in the e-business relationships in the agri-food system. Starting from the results of a previous analysis, the objective of this paper is focused on testing a simple method for prioritizing some trust factors in Business-To-Business (B2B) e-trade relationships between actors operating in the agri-food system.

The paper is structured as follows. First, the theoretical concept regarding trust and its specific role in the business relationships is briefly introduced. Then, a description of selected trust factors, and the main features of the available data of the Analytic Hierarchy Process (AHP) prioritizing technique are presented. Finally, the paper presents a hierarchy of importance of the trust factors considered in this work.

## 2. Theoretical background

Despite the paramount importance ascribed to trust, several different definitions are available in the literature and a shared logical construct to describe the concept of trust does not exist. This is probably due to the multidisciplinary of studies conducted on this topic, where each discipline copes with a specific aspect of trust, neglecting some others.

The wider range of studies is available in the disciplines of psychology, sociology, and economics. Recently the role of trust in computer mediated relationships has also been explored (Tan and Thoen, 2002; Falcone and Castelfranchi, 2002; Canavari *et al.*, 2003; Fritz *et al.*, 2005; Ratnasingham, 2005).

The psychological approach is mainly focused on highlighting the personal characteristics and conditions able to stimulate a collaborative behavior, in dyadic relationships, with trust considered as a special mind set (Rotter, 1967; Deutsch, 1958; Gambetta, 1989).

The sociological approach is more focused on the factors and mechanisms able to generate trust in the social fabric and in the field of interpersonal and inter-institutional relationships. (Granovetter, 1985). Trust is considered the element which is able to ease coping with the complexity of social systems and stabilize the relationships (Luhmann, 2002).

The approach of economics is mainly interested in the transaction cost associated with relationships between economic institutions (Williamson, 1998). This orientation, however, is sometimes disputed, on the grounds that it limits the role of trust, constraining it into a pure rationality context (Castaldo, 2002).

Actually, the above mentioned approaches frequently overlap. The social, cultural, emotional aspects of the economic actors are often considered together with the economically rational ones, as components able to affect the role (and the amount) of trust with the network relational dynamics. Both the emotional and rational dimensions of trust then appear to be necessarily considered in the study of this issue.

Specific research areas may be reconducted to this comprehensive approach in the fields of marketing (Castaldo, 2002; Nardin, 2002; Doney and Cannon, 1997), organizational behavior (Lewicki and Bunker, 1996; McKnight *et al.*, 1998), and strategic behavior (Boersmaa *et al.*, 2003; Dyer and Chu, 2000).

Since it is necessary to take a reference point, and we prefer a more general and comprehensive definition, in this paper trust is defined as in Mayer *et al.* (1995), "willingness of a party to be

vulnerable to the actions of another party based on the expectation that the other will perform particular action important to the trustor, irrespective to the ability to monitor or control that other party".

### 3. Critical trust factors in an agrifood B2B e-commerce environment

A hierarchy of trust promoting elements into a B2B e-commerce agri-food environment and apart from previous or existing relationship, have been analyzed following two steps.

A previous analysis (Canavari *et al.*, 2005) allowed us to identify a set of components of trust in agri-food chains. These components and a possible conceptual structure have been validated by a group of experts operating in various areas of the agri-food system. Finally, a set of 19 elements, grouped in 6 factors in its turn classified in 3 categories, was selected.. For the sake of brevity, in the following paragraphs the meaning of categories and factors will be described without considering the single elements.

#### 3.1. Categories

**Category 1: Shared values and motivation (ShM).** Sharing the same values and converging objectives are often mentioned as important motivational mechanisms which promote trust (Rocco and Haeblerle, 2001). This category may be likened to the concept of psychological contract proposed by Rousseau (1995) and supported by other authors (Sheppard and Sherman, 1998), according to which sharing values and motivations is able to trigger reciprocal positive expectations between the involved subjects and mutual collaboration and commitment to reach common goals.

**Category 2: Credibility and reputation (CrRe).** This category expresses an esteem level for the organization managing the e-commerce platform as well as for the actors operating on it. Abdul-Rahman and Hailes (2000) define credibility and reputation as a form of social control and guarantee, based on the exchange of information regarding professionalism, reliability and integrity of trustee. Balanced information about reputation and credibility of the trustee between the operators acting (or willing to act) within a system, allow to apply sanctions to those who adopt opportunistic behaviors, determining their progressive alienation or exclusion. This category is widely discussed in the literature on social psychology and it is often interpreted as the perceived probability that the trustee behavior will produce performances coherent with the trustor expectations (Rotter, 1967). Then, credibility and reputation may be interpreted as social assets that the subject offers to the trustor as a guarantee, and they may become a fundamental motivation for deterring opportunistic behaviors.

**Category 3: Availability to integrate/Non opportunistic behavior (IB).** This category represents the perceived availability to accept risks deriving from sharing information, operational procedures, and other know-how with the e-marketplace or EC tools manager. This attitude may be interpreted as a sign of the willingness to maintain a fair behavior and integrity in the relationship, granting the counterpart access to critical information.

McAllister (1995), highlights the fact that the reciprocal availability to integrate and the reciprocal availability to renounce to opportunistic behaviors do evolve with time. After an initial empathic phase, the perception becomes progressively based on the involved parties' past experiences.

### 3.2. Factors

**Factor 1: Culture (C).** This factor, linked with category ShM, is actually related to the trustor's perceived cultural affinity with the trustee. An important aspect may be represented by the possibility to communicate using one's own language or a common language, but it also deals with several other aspects linked with culture, such as the communication style, formal rules, relational models, contrasting or unknown coded behaviors, etc. These elements are perceived as important in multicultural environments, because of possible problems derived by the lack of shared values. The creation of a common "*forma mentis*" may be a prerequisite to stimulate convergence of mutual expectations and reduce perception of risks (Rocco and Haeberle, 2001) involved in undertaking long distance commercial relationships. Many signals pertaining to the sphere of cultural affinity are often transmitted through direct (and non-verbal) communication, and they are able to strengthen the sense of social identity (Orbell *et al.*, 1981).

**Factor 2: Motivation (M).** This factor, also linked to category ShM, is often defined "goal congruence", and it represents the trustor's perception of an alignment of the reciprocal objectives between the involved actors. It is linked to the ability to stimulate a mutual commitment in the relationship, reducing the sense of uncertainty and vulnerability, thus constituting a basic mechanism to increase trust (Rocco and Haeberle, 2001).

**Factor 3: Professionalism (P).** Competences and abilities to perform the role assigned within the network (platform manager, IT professionals, monitoring and auditing professionals, sellers and buyers, legal advisors, etc.) are essential components in order to let the trustor evaluate and/or the trustee guarantee the security requisites of the transactions supported by IT tools.

**Factor 4: Legal assistance (LA).** The legal framework as well as the level of assistance and legal support in the event of controversies related to documents or transactions between the actors is considered an important factor, affecting both CrRe and IB, and discouraging/encouraging the adoption of fraud-like behaviors.

**Factor 5: Transparency (T).** It is one of the possible forms to allow (or give the perception of) control. Where the trustee is empowered to perform a task, e.g. supervision or surveillance, it may be required to establish a reciprocal exchange of information or to allow publicity of the outcomes within the network. Information sharing allows the involved actors to reduce the perception of vulnerability, increasing the level of predictability of the counterpart's behavior. The chance to continuously monitor the evolution of the relationship represents a sort of "courting" (Shapiro *et al.*, 1992), favoring the reciprocal knowledge on the intentions and the meeting of interests and objectives, consolidating the trust relationship.

**Factor 6: Institutional protection (IP).** This factor can be seen as a sort of control on behalf of an authority outside the network of relationships established by economic agents. According to McKnight *et al.* (1998) "trust based upon rules" and "institutional trust" identify kinds of trust which are stimulated by institutional systems of control through the monitoring of

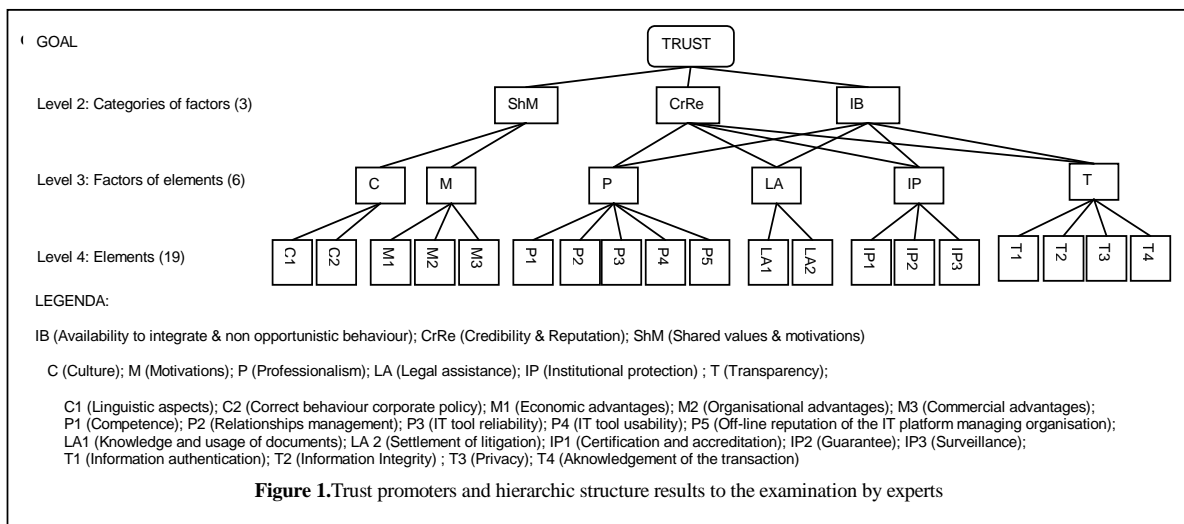
trustee's activity in respecting duties according to established rules. As a result the authority in charge of controlling the entire process can break this relationship by asking the trustee to modify his activity to satisfy the needs of the trustor. The controlling authority can also inflict endorsements and its action aims at minimizing any sense of vulnerability by parties involved in the relationship (Falcone and Castefranchi, 2002).

#### 4. Materials and Methods

The prioritization of the trust promoting factor have been performed with the help of AHP (Saaty, 1980). Trust promoters towards B2B e-commerce in the agri-food sector were given an order of priority through the following phases:

- Validation of the trust factor hierarchy;
- Data collection;
- Calculating the vectors of priority;
- Analysis of consistency of evaluations.

After the preliminary phase, hierarchical structure was broken down as shown in figure 1. At the end of the meeting with experts it was decided to keep the ShM category independent. This choice was justified by the fact that ShM is perceived as a border line between the cognitive and the emotive dimensions of trust. Moreover, it was observed that the single elements indicated by experts to represent each factor are univocally referred to with the same factor. This peculiarity allowed us to rank trust elements in order of importance for each of the factors indicated.



Information was gathered by means of a questionnaire which was administered to 5 privileged witnesses in the Emilia-Romagna region. The approach used was that of paired comparisons on trust elements indicated in the hierarchical structure. In particular, interviewees had to express their judgment in terms of importance by comparing each proposed pair with a component situated one level above in the hierarchical structure. The measurement scale used

was a 9-point paired relative importance scale (Saaty, 1980). The average judgment of the five respondents was recorded in positive and reciprocal pair-wise comparison matrix  $A_{ij} = (a_{ij})$  with  $i=j$  ( $i, j = 1, 2, 3, \dots, n$ ), in which rows and columns correspond to compared trust components.

As suggested by Saaty (1980), a good method to obtain the local vectors of priority of trust factors (eigenvector) with respect to its preceding element is to normalize the geometric mean in each row matrix (the  $n$ th root of the product of the elements).

In order to calculate the global weight of factors P, LA, IP, T (with regard to categories CR and IB) and factors C, M (with regard to category ShM) firstly the weight of categories IB and CR were normalized. Secondly the local weight of each factor (P, LA, IP, T and C, M) was multiplied by the new normalized weight of its preceding categories of reference. On the basis of this hierarchical structure, the eigenvector of elements concerning each factor is the result of the ranking importance of the specific factor's elements.

The evaluation of consistency of expert judgments was carried out calculating the consistency ratio (CR) for each pair-wise comparison matrix. Saaty (1980) suggests the following five steps: first, each matrix is multiplied by each eigenvector in order to obtain a new vector. Second, the first element of this new vector has to be divided by the first element of the eigenvector, its second element by the second element of the eigenvector and so on. In this case another vector will be obtained.

Third, the principal eigenvalue  $\lambda_{max}$  has to be calculated dividing the sum of the elements of the above vector by the number of elements of the vector.

Fourth, the consistency index (CI) is obtained as follows:

$$CI = (\lambda_{max} - n) / (n - 1) \quad (1)$$

where  $n$  is the number of components of the pair-wise matrix in question.

Fifth, the consistency ratio (CR) is calculated as follows:

$$CR = CI / RI \quad (2)$$

where  $RI$  is the random index proposed by Saaty (1980). The  $RI$  is an index that changes according to the number of matrix components.

## 5. Results

For the hierarchy of trust factors, global weights of the components were calculated. On the left side of table 1 the local weight of elements considered and the values of the CR index for each pair-wise comparison matrix are reported. On the right side of the table the ranking of the components according to global weights are reported.

An analysis of the values of the CR allows us to accept all the vectors of the local weight because in all cases this value was less than 0.10 (Saaty, 1980). Moreover, it is possible to note that local and global weights of trust factors categories are equal (level 2). This is justified by the fact that the previous referring level is the objective of the survey.

Focusing on hierarchical components (see the right part of Table 1), it emerges that the main elements which are able to stimulate trust in an agro-food B2B e-commerce are the credibility and reputation of economic agents managing electronic markets ( $CrRe=0.633$ ). Furthermore,



even if the other two categories of factors (ShM=0.282; IB=0.085) appear to be less important, this does not imply that the same categories have to be overlooked. In particular, the global weight of the ShM category highlights how the share of values and motivations among economic agents can be considered as aspects which can stimulate trust. The perception of synchronicity of intents among the economic agents involved in the relationship seems to minimize risk perception in the adoption of these kinds of relationships, thus stimulating reciprocal commitments in reaching shared objectives.

Among factors able to increase reputation (CrRe), respect for the trustee, the perception of transparency in the relationship (T=0.434) and the perception of professionalism (P=0.398) are among the most important. The former seems to be reachable through the authentication of information (T1=0.165) and the opportunity to be continuously informed on the state of transactions (T4=0.147). The perception of professionalism seems to be induced particularly by the off-line reputation of the trustee (P5=0.139) and by the accessibility of the information tool proposed by the trustee to manage the relationships (P4=0.103).

Cultural features (C=0.528), and motivations (M=0.472), appear being of equal importance in stimulating the ShM category.

**Table 1.** The prioritizations of trust factors

Local				Global				
CR	Level	Component	Weights	Level	Prioritizations	Global weights	Sum of weights	Concerning components
0.033	Level 2	CrRe	0.633	Level 2	1. CrRe	0.633	1.000	Trust
		ShM	0.282		2. ShM	0.282		
		IB	0.085		3. IB	0.085		
0.020	Level 3	With respect to CR		Level 3	1. T	0.434	1,000	CR. IB
		P	0.410		2. P	0.398		
		LA	0.092		3. LA	0.090		
		IP	0.070		4. IP	0.078		
		T	0.428	Level 3	1. C	0.528	1.000	ShM
0.040	Level 3	With respect to IB			2. M	0.472		
		P	0.310	Level 4	1. T1	0.165	1.000	P, LA, IP, T
		LA	0.074		2. T4	0.147		
		IP	0.139		3. P5	0.139		
		T	0.478		4. P4	0.103		
0.000	Level 3	With respect to ShM			5. LA1	0.070		
		M	0.472		6. P3	0.070		
		C	0.528		7. T2	0.067		
0.000	Level 4	With respect to C			8. P1	0.063		
		C1	0.200		9. T3	0.060		
		C2	0.800		10. IP1	0.036		
0.030	Level 4	With respect to M			11. P2	0.029		
		M1	0.573		12. IP3	0.023		
		M2	0.127		13. LA2	0.021		
		M3	0.300		14. IP2	0.009		
0.095	Level 4	With respect to P		Level 4	1. C2	0.422	1,000	C. M
		P1	0.156		2. M1	0.271		
		P2	0.071		3. M3	0.142		
		P3	0.173		4. C1	0.106		
		P4	0.255		5. M2	0.060		
		P5	0.345					
0.000	Level 4	With respect to LA						
		LA1	0.765					
		LA2	0.235					
0.080	Level 4	With respect to IP						
		IP1	0.457					
		IP2	0.114					
		IP3	0.292					
0.010	Level 4	With respect to T						
		T2	0.152					
		T3	0.136					
		T4	0.335					
		T1	0.377					

## 6. Final remarks

Trust is recognized as an important asset for Business-to-Business e-commerce success in agro-food markets. Taking the results of a previous analysis as a starting point, this paper aimed at prioritizing 28 trust promoters in e-relationships between actors operating in agro-food markets. The results indicate that trustee reputation (CrRe) is the most critical category of factors to promote trust in this kind of relationship. Of the four factors regarding the reputation, the perception of transparency and the professionalism of the trustee are the most important. These factors seem to be stimulated through IT tool usability and off-line reputation of the trustee.

The first managerial implication of this research concerns the opportunity offered to practitioners to be aware of the existence of specific trust factors in an agri-food B2B e-commerce environment. Moreover the ranking of promoters help practitioners to understand their importance. This is helpful for them in the choice of strategic plans to stimulate trust.

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This paper is the result of a strict collaboration among the authors and the analysis was jointly designed and performed. Just for the sake of the Italian evaluators, the contribution of each author is identified as follows: Maurizio Canavari sections 1 and 5, Sergio Rivaroli sections 2 and 4, Melanie Fritz sections 3.1 and 6, Tobias Hausen section 3.2.

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