

A Methodology to Ascertain the Level of Failure in an E-Commerce Interaction

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Abstract

To ascertain the possible level of risk in an e-commerce interaction, the initiating agent needs to determine beforehand the probability of failure and the possible consequences of failure to its resources in interacting with an agent. The initiating agent can determine beforehand the probability of failure in interacting with an agent either by considering its past interaction history with it or by soliciting recommendations from other agents. In both cases, it is imperative for the agent who is either considering its past interaction history, or who is communicating a recommendation about another agent, to know the accurate level of failure in interacting with the other agent. To achieve this, in this paper we propose a methodology by which the initiating agent of the interaction ascertains the level of failure in the interaction, after interacting with an agent.

Keywords: Criterion, Evaluation, Failure scale, Level of Failure, Un-committed behaviour

1. Introduction

The development of the internet has given its users more flexibility for conducting e-commerce interactions. It has provided its users with various functionalities which will facilitate the way e-commerce interactions are carried out. With the provision of increased functionality for facilitating e-commerce transactions also comes the fear of loss or the fear of not achieving what is desired in an interaction. This fear of loss or not achieving what is desired is associated with 'Risk' in the interaction. In the literature, risk has often been seen as a synonym for trust. Mayer et al. (1995) highlight the confusion in the relationship between risk and trust by stating '*it is unclear whether risk is an antecedent to trust, is trust, or is an outcome of trust*'. But in real terms, trust and risk refer to two important concepts that complement each other and help the initiating agent of the interaction to analyse and then make an informed decision about its future course of interaction with the other agent. Both these concepts, although are complementary, express different meanings which in turn cannot be reciprocated. Hence, it is incorrect to compare and decide as to which one of them is more important for better decision making in an interaction.

The term 'Risk' has been defined in different ways in the literature according to the context in which it is being discussed in. The literature defines risk according to how it best fits and expresses its object of analysis in the context of discussion (Gefen et al. 2003; March et al. 1987; Luhmann 1988; Rousseau et al. 1998; Sztompka 1999) Subsequently, risk is assessed according to how it is defined in that particular context. The definition of risk and its assessment methods of a discipline cannot be applied to define and analyse risk in other disciplines, as the way risk is interpreted and assessed in those disciplines varies and would result in incorrect conclusions if applied. Therefore, in the context of e-commerce interactions, we define and interpret risk as a multidimensional construct which is a

combination of the probability of failure of an interaction and the subsequent possible consequences of failure.

Risk analysis in the context of e-commerce interactions requires that the initiating agent to determine beforehand the probability of failure and the subsequent possible consequences to its resources if it were to proceed with an interaction with an agent. This is different from trust analysis, where the initiating agent measures the belief that it has in a probable agent in attaining its desired outcomes. During trust analysis the initiating agent does not take into account the amount of resources that it is going to invest in the interaction and hence does not determine the possible consequences of failure in those. A lot of work has been done in the literature to determine and evaluate trust in an interaction (Koutrouli et al. 2006; Chein et al. 2006; Hussain et al. 2004; Cornelli et al. 2002; Carter et al. 2004). We will not discuss that work as, in this paper; our view is towards risk analysis. Hence, we term the two agents participating in an interaction as the 'risk assessing agent' and 'risk assessed agent'. The former refers to the one initiating the interaction while the latter refers to the one with whom it interacts with, to achieve its desired outcomes in the interaction. It is possible that the risk assessing agent before initiating an interaction might have to choose an agent to interact with, among a set of probable agents. In such a case, it can ease its decision making process by analyzing the possible risk present in interacting with each of them. The Australian and New Zealand Standard on Risk Management, AS/NZS 4360:2004 too states that Risk Identification is the heart of Risk Management (Cooper 2004). The significance of the risk assessing agent to analyse the possible risk before initiating an interaction with a probable risk assessed agent is substantial. The risk assessing agent, by analysing the possible risk beforehand, could gain an idea of whether it will achieve its desired outcomes from the interaction or not. Based on this, it can safeguard its resources. Risk plays a central role in deciding whether to proceed with a transaction or not. It can broadly be defined as an attribute of decision making that reflects the variance of its possible outcomes. Risk analysis is important in the study of behaviour in e-commerce transactions because there is a whole body of literature based in rational economics that argues that the decision to buy is based on the risk-adjusted cost-benefit analysis (Greenland 2004). Thus, it commands a central role in any discussion of e-commerce that is related to a transaction.

For risk analysis in e-commerce interactions, the risk assessing agent has to determine beforehand the two above-mentioned factors in interacting with a probable risk assessed agent. We have developed methodologies by which the risk assessing agent can determine beforehand the probability of failure and the possible consequences of failure in interacting with an agent (Hussain et al. 2007). In that methodology, we proposed that the risk assessing agent determines the probability of failure in interacting with a probable risk assessed agent either by considering its past interaction history or, if it does not have any, then by taking recommendations from other agents. In both the cases, it is important that the risk assessing agent or the agent giving the recommendation has previous knowledge about the level of failure of the risk assessed agent in the particular context. These agents can have the previous knowledge about the risk assessed agent only based on their past interaction history with it. So, in this paper, our aim is to propose a methodology by which an agent summarises the level of failure in the interaction, after interacting with an agent, so that it can utilise it in the future for further possible interactions with the same agent, or to act as a recommending agent itself. The proposed methodology is explained in the next sections.

2. Defining the Failure Scale

For the risk assessing agent to determine the probability of failure in interacting with a probable risk assessed agent before initiating an interaction with it, we proposed the terms 'FailureLevel' and the 'Failure scale'. FailureLevel quantifies and semantically expresses the possible level of failure in the interaction on the failure scale. The Failure scale as shown in Figure 1 represents the different levels of failure possible in an interaction. In the methodology, we proposed that the risk assessing agent determines the FailureLevel in interacting with a probable risk assessed agent by ascertaining its in-capability to complete the interaction according to the context and criteria of its future interaction with it. Context represents the high level nature of the risk assessing agent's interaction with the probable risk assessed agent (Hussain et al 2004). It can be decomposed into several detail aspects called criteria. 'Criteria' is defined as the 'demand' or the 'set of factors' which show specifically what the risk assessing agent wants in its interaction with the probable risk assessed agent in that particular context. The risk assessing agent communicates its desired criteria to the probable risk assessed agent in the form of expected or mutually agreed behaviour, before initiating an interaction with it (Hussain et al 2004). 'Expected behaviour' is defined as that behaviour which the risk assessing agent expects the probable risk assessed agent to commit to achieve its desired criteria or when both the agents negotiate to behave in the interaction in a certain way to achieve the desired criteria, then that is called as the 'Mutually agreed behaviour'. The risk assessing agent, by considering the context and particular criteria of its future interaction, will ascertain the in-capability of the probable risk assessed agent to complete the interaction according to its expected behaviour or the mutually agreed behaviour. Further in this paper we use the terms expected and mutually agreed synonymously.











Semantics of Failure Level	Probability of Failure	FailureLevels	Star Rating
Unknown	-	- 1	Not Displayed
Total Failure	91 - 100 % Probability of Failure	0	Not Displayed
Extremely High	71 - 90 % Probability of Failure	1	From  to 
Largely High	51 - 70 % Probability of Failure	2	From  to 
High	26 - 50 % Probability of Failure	3	From  to 
Low	11- 25 % Probability of Failure	4	From  to 
Extremely Low	0 - 10 % Probability of Failure	5	From  to 

Figure 1: The Failure scale

We propose that the risk assessing agent after interacting with a risk assessed agent should summarize the level of failure in interacting with it according to its expected behaviour, on the same Failure scale which it had utilized prior to the interaction. The failure scale as shown in Figure 1 represents seven levels of failure that could be possible in an interaction. Each level represents the possible degree or magnitude of failure of an interaction. In the next section, we will define the semantics of each level on the failure scale.

2.1 Defining the Semantics of the Failure scale

- Unknown

The first level of the failure scale is termed 'Unknown Failure' and its corresponding FailureLevel is -1. This level suggests that the level of failure in interacting with the risk assessed agent is unknown.

Semantics: This level can only be assigned by the recommending agent to the risk assessed agent if it does not have any past interaction history with it, in the context, criteria and time in which it is communicating its recommendation. In such a case, we propose that the recommending agent, instead of recommending any random FailureLevel in the range of (0, 5) on the Failure scale, recommends the level -1 to the risk assessing agent soliciting for recommendations. An important point to note is that all new agents in a network begin with this value and a FailureLevel of -1 is assigned to the risk assessed agent when there are no precedents that can help to determine its FailureLevel.

- Total Failure

The second level of the failure scale is defined as 'Total Failure' and its corresponding FailureLevel value is 0. A FailureLevel value of 0 suggests that the level of failure present in interacting with the risk assessed agent was between 91-100 %.

Semantics: This level on the failure scale suggests that at a given point in time and with the given criteria the risk assessed agent was totally or completely unreliable in completing the desired outcomes. In other words, it did not complete the interaction according to the expected or mutually agreed behaviour at all and acted fraudulently in the interaction thus resulting in total failure for the risk assessing agent in achieving its desired outcomes. The FailureLevel of 0 expresses the highest level of failure possible in an interaction.

- Extremely High

'Extremely High' is the third level on the failure scale with the corresponding FailureLevel value of 1. This level denotes that there was 71-90 % level of failure in interacting with the risk assessed agent.

Semantics: This level on the failure scale depicts that at a given point in time and with the given criteria the risk assessed agent was unreliable most of the time with regards to achieving the desired outcomes. It deviated from the expected behaviour most of the time, hence, resulting in an extremely high level of failure in the interaction.

- Largely High

The fourth level of the failure scale is termed a 'Largely High' level of failure. The corresponding FailureLevel value of this level is 2. This level depicts that there was 51-70 % probability of failure in interacting with the probable risk assessed agent.

Semantics: A FailureLevel of 2 on the failure scale indicates that there was a significantly high level of failure in the interaction as the risk assessed agent, at the given point in time, did not commit to a greater extent of the expected behaviour.

- High

The fifth level on the failure scale is termed a 'High' level of failure and is shown by a FailureLevel value of 3. This level outlines that there was 26-50 % probability of failure in the interaction.

Semantics: A FailureLevel value of 3 on the failure scale assigned to a risk assessed agent suggests that at that particular point in time, the risk assessed agent was unable to complete

the interaction to a large extent according to the expected or mutually agreed behaviour, hence, resulting in high level of failure in the interaction.

- Low

The sixth level on the failure scale is defined as 'Low' level of failure with a corresponding FailureLevel value of 4. This level depicts that there was 11-25 % probability of failure in the interaction.

Semantics: This level on the failure scale suggests that at a given point in time the risk assessed agent completed most but not the entire criterion according to the expected or mutually agreed behaviour. A FailureLevel of 4 indicates that the risk assessed agent assigned with this value can be relied on to a greater extent in that time, to commit to the desired outcomes of the interaction thus resulting in low failure level in the interaction.

- Extremely Low

'Extremely Low' is the seventh and the last level on the failure scale represented by the FailureLevel value of 5. This level shows that there was 0-10 % probability of failure in the interaction.

Semantics: This level on the failure scale implies that at a given point in time, the risk assessed agent has completed the interaction according to the expected or mutually behaviour, subsequently minimising the probability of failure in an interaction. The probability of failure in interacting with this risk assessed agent, if any, will be minimal. A FailureLevel of 5 expresses the lowest level of failure possible in an interaction. A FailureLevel of 5 expresses the lowest level of failure possible in an interaction.

In the next section, we will propose a methodology by which the risk assessing agent can determine the possible level of failure in interacting with a risk assessed agent.

3. Metrics for Determining the Actual FailureLevel of the Interaction

Our method for the risk assessing agent to determine the actual level of failure of an interaction in the post-interaction phase is by assessing the level of un-committed or un-fulfilment in its actual behaviour as compared to the expected behaviour. This is achieved through the notion of 'expectations' and 'assessing un-commitment' in the interaction. By 'expectations' we mean the expected behaviour. This is the way in which the interaction is supposed to proceed according to the criteria of the interaction. By 'assessing un-commitment' we mean assessing the degree of un-fulfilment or un-commitment in the actual behaviour of the risk assessed agent with respect to the expected behaviour during an interaction. To achieve this, we propose that the risk assessing agent should first determine the level of commitment that the risk assessed agent showed in its behaviour in the interaction. This will depict how the risk assessed agent actually behaved in the interaction and how much he fulfilled according to the expected behaviour. If the level of commitment (i.e. the actual behaviour) is compared with the expected behaviour (i.e. the promised commitment) then the un-committed behaviour in the interaction can be determined. In other terms, the level of un-committed behaviour in the interaction is the difference between expected and actual behaviour. This un-committed behaviour is used to determine the level of failure in the interaction. The greater the un-committed behaviour the greater is the level of failure in an interaction.

As mentioned earlier, the expected behaviour of an interaction is composed of the criterion that the risk assessing agent wants to achieve in the interaction. Hence, when determining the level of failure, it is important for the risk assessing agent to consider each criterion of its interaction to determine the commitment and subsequently the failure level of the risk

