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Probabilistic assessment of financial risk in e-business associations

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ABSTRACT

Business activities are a result of carefully formed associations between different users in order to achieve certain pre-decided outcomes. Decision-making in such associations is an important step and transactional risk analysis is one of the integral processes that facilitates this step. This paper presents an approach that determines the negative consequences (termed as financial risk) of forming e-business associations. Unlike other approaches, our model captures the different types of events and their uncertainties to determine the financial risk by using the convolution operator and expressing it as a probabilistic measure rather than as a crisp financial value. Such representation makes sense as the financial risk may be determined at a point of time in future where nothing is certain. Depending upon the complexity of the problem, we explain the different ways of using the convolution operator to determine the financial risk. The simulation result shows a better representation and understanding of the financial risk that will provide important inputs to the transactional risk analysis and the decision-making process.

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1. Introduction

Current business trends and statistics show the growth of e-business or doing business electronically in the B2C and C2C interaction paradigm. Some of the primary factors responsible for this increase may be an improvement in the user's efficiency and productivity due to the ease with which activities can be carried out and tasks completed in less time, and a reduction of the delays associated with the conventional business methods. But apart from the benefits, business associations in such paradigms also produce concerns or the fear of loss in various aspects such as privacy of personal data, unauthorized use of personal information, secureness of the interaction medium, genuineness of the other user, successful completion and achievement of outcomes in the business association etc. Such fear of loss is termed 'risk' in the business association. Depending upon the type of loss being discussed, risk can be specialized so that its impact can be represented correctly according to the object of discussion. For example, the fear of the secureness of the interaction medium can be termed as security risk, the loss in personal information as privacy risk and there may be other types of risks such as legal risk, strategic risk, operational risk that may be possible in the business association according to the perspective being taken. In today's competitive business world, the aim of each user would be to avoid any such losses, while simultaneously achieving maximum returns and benefits. This is achieved by making an informed interaction-based decision, one step of which is risk analysis. Risk analysis is a process whereby the different types of risks are identified, their impacts assessed, and then managed up to a certain acceptable level of tolerance that may result in the successful completion of the business association. Various researchers in the literature have attempted to study the different types of risks and their impact on the successful completion of the business activity [1,2]. But an important point to understand is that even though all these different

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types of risks may relate to the same business association, the analyses they represent are vastly different from each other, subsequently varying also the process of their analysis.

In this paper, we discuss transactional risk, which is one type of risk that should be considered when making a decision about initiating a business association. It is mentioned in the literature that the decision to buy is related to the cost-benefit analysis [3] and subsequently, transactional risk which indicates the chances of failure and the negative consequences of engaging in the business association, will be one of the key drivers in influencing the behavior of a user when engaging in a business activity. Hence, approaches are needed whereby these factors are identified, assessed and utilized for making an informed interaction-based decision. Our focus in this paper is on one sub-category of transactional risk, namely, the negative consequences or loss of engaging in a business association, which we term 'financial risk'. In this sub-category we focus on the risk identification and risk assessment phase in the process of risk analysis and propose a novel probabilistic-based approach to ascertain the financial risk in the business interaction. Such analysis is an important prerequisite to ascertain the beforehand the transactional risk in forming a business association. This paper is organized as follows: In Section 2, we discuss the importance of the analysis of transactional risk and differentiate it from the analysis of security and trust when making a decision about forming a business association. We then briefly discuss our previous work on transactional risk analysis and define the problem that is addressed in this paper. Related work from the literature according to the problem statement is then discussed. In Sections 3–5, we propose an approach to capture the different types of uncertain events and ascertain the financial resources to be kept at stake as a result of that. In Sections 6–7, we present our approach for determining the financial risk in forming a business association. In Section 8, we conclude the paper.

2. Problem statement

2.1. Importance of considering transactional risk while forming an informed business association

The outcome of a business association can be broadly classified into three types, which are: (a) positive (b) neutral and (c) negative. A positive outcome is when the interaction initiating user obtains more from its interaction than what it initially expected to achieve. A neutral outcome is when an interacting user gets exactly what it was expecting to achieve in its interaction; whereas, negative outcome is when the interacting user does not get what it was expecting to achieve as an outcome of its interaction. A business association may be formed between any two users in order to achieve an outcome which meets a combination of different criteria or factors, each of which will play a part in the successful completion of the business association. But each or some of these criteria may have uncertainty associated with them that may result in either their non-occurrence or occurrence not as desired, thereby producing a negative outcome. An analysis of transactional risk while decision-making determines the uncertainty that will produce a negative outcome in the interaction, and the impact or consequences that may be caused as a result of the desired outcomes not being achieved. Such an analysis of risk will significantly impact on the interacting user's informed decision-making about a business interaction. But by analyzing the literature, we note that despite its importance, the concept of transactional risk has often been confused with trust or security while forming an e-business association. Security in e-business association relates to the process of having a secure environment or a secure space in the open architecture of the web, where the customers exchange information with other entities or businesses. This is with an assurance that the information which they share and utilize is being sent only to, and by, the intended person, and that the information is not being changed in any way. Enhancing the security protects the users from intrusions, attacks from the outside world and safeguards them from vulnerabilities. In the literature, trust has been broadly discussed in two ways. Firstly the word 'trust' is taken to measure trust in the security-related aspects of the interaction. The concept of 'Trusted Computing' has been proposed in the literature in an attempt to solve some of the security problems encountered in today's world by adopting the security mechanisms. Secondly, in the context of an e-business association, the word 'trust' refers to the level of confidence that the user has in the other user's ability to deliver its desired outcomes through the interaction. Within the e-business context, for the user to have the necessary level of trust to commit itself to an interaction, it needs to believe that the other user can help it to achieve its desired outcomes. Hence, a clear distinction can be drawn between trust and security in the context of decision-making in e-business associations. As with the cross relationship between security and trust, the same holds for the relationship of risk with security, and risk with trust as discussed in the literature. In the context of e-business associations, the analysis of risk in the area of security will ascertain only the security risks present in the interaction [4–6]. Such risks will not provide the meaningful information to the interacting user required for making an informed e-business association decision. This is because the level of risk determined in those areas is not synonymous with the level of risk to be determined (transactional risk) for decision-making in an e-business association. Similarly, another confusion that arises in the literature is the relationship between trust and transactional risk. This relationship considers trust to be the authoritative concept to transactional risk, and decision-making can be carried out only on the level of trust as it also represents or nullifies the level of transactional risk in the interaction [7,8]. But trust and transactional risk are different concepts which require different analysis according to the different areas of the interaction to which they are targeted. The analysis of trust in the interaction omits and does not represent the degree of failure and the magnitude of negative consequences to the interacting user as a result of engaging in the e-business association. Such concepts can be determined only by the analysis of transactional risk; omitting this while decision-making is equivalent to ignoring possible failure and the negative consequences of that interaction.

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