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## Supporting factoring transactions in Brazil using reasoning maps: a language-based DSS for evaluating accounts receivable<sup>☆</sup>

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### Abstract

Factoring companies are a widespread way of providing working capital to small enterprises in Brazil. This type of financial transaction has higher risks when performed in developing countries, due to unreliable financial information on firms, an unstable environment, and particular managerial practices. This paper describes a case study in which a language-based DSS was developed for a Brazilian factoring company to evaluate the perceived risk of buying accounts receivable; and discusses the suitability of different approaches to decision support for this type of decision in Brazil—which may be relevant for similar situations in other developing countries.

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### 1. Introduction

Factoring companies are a widespread way of providing working capital for small enterprises in Brazil. A factoring transaction is a triangular financial operation, where the factoring company buys accounts receivable from its client (the creditor firm), and takes the burden of collecting them from

its client's customers (the debtor firms). Brazilian factoring companies operate a high risk/high return business, in an environment characterised by high interest rates and spreads, an unstable macroeconomic situation, a weak legal framework which does not allow a quick recovery of collaterals, and a lack of adequate information on potential borrowers (see Ref. [9] for details on this problem). Perhaps surprisingly, given the prevalence of these operations and the general interest in credit appraisal techniques, there appears to be a lack of decision support systems developed for the tri-partite factoring transactions discussed here.

This paper is part of an ongoing action-research effort which attempts to support decision-makers

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dealing with this type of problem (see Ref. [4] for a discussion about the use of action-research in the DSS context). This has the dual aim of providing decision support and exploring the appropriateness of different approaches to doing so, given the distinctive characteristics of the problem context. In a previous case study, we employed a quantitative multi-criteria model, which evaluates several dimensions of perceived risk, for developing a DSS (see Ref. [5] for details). This first intervention provided several insights into particular characteristics of this problem, especially its qualitative nature and the decision-makers' willingness to think and talk in qualitative terms. These insights lead us to intervene again; now using a different, recently developed decision tool—called a reasoning map—which provides integrated support for both problem structuring and qualitative assessment of alternatives using a cognitive/causal map structure. Reflecting the nature of the action research, the paper is aimed at DSS practitioners and researchers with an interest in the specific application area of financial decision-making and/or the appropriateness of different approaches to decision support for this type of decision in developing countries.

The paper begins with a brief introduction to reasoning maps, which is then elaborated through its use in the development of a DSS to evaluate accounts receivable. We conclude with reflections on the process, in particular on how the specific characteristics of the problem may influence the use and development of DSSs.

## 2. Reasoning maps

A reasoning map is a tool for multi-criteria decision aid, the development of which was motivated by a desire to provide an integrated approach to problem structuring and evaluation (which, so far, have been supported by different methods [1]). It permits the evaluation of decision alternatives along a means–ends network, using qualitative assessments of performance. In this way, it extends the power of inference of causal maps, which are primarily conceived of as a tool to support problem structuring and stop short of the evaluation of alternatives.

Several ways of increasing the power of causal inference in causal maps have been proposed in the

literature (e.g., Refs. [2,6,10]). However, none of these approaches were concerned with the use of a causal map to perform a multi-criteria evaluation of alternatives. On the other hand, several multi-criteria methods have employed qualitative assessments but, as far as we know, none has tried to evaluate decision alternatives along chains of qualitative arguments.

The construction of a reasoning map can be divided in two main recursive phases (see Refs. [8,9] for details about the method). In the first phase, the building of a reasoning map supports problem-structuring, capturing a decision-maker's reasoning as a network of means and ends concepts. In the second phase this map is enhanced, using a user-defined qualitative scale to define performances and strengths of influence. This latter phase supports the decision-maker in evaluating the positive and negative impacts of an action through synthesis of the qualitative information. A set of macros in VBA Excel for Windows has been developed to perform the analysis of reasoning maps; it also allows the input of reasoning maps using standard shapes and connectors, or causal maps imported from the Decision Explorer software ([www.banxia.com](http://www.banxia.com)). In the next section we describe the intervention while, at the same time, briefly presenting the method.

## 3. Supporting factoring decisions with reasoning maps

In this section we present the intervention in which a reasoning map was developed to support the evaluation of accounts receivable by a factoring manager. We first describe the process of problem structuring, then the elicitation of preference information, and the evaluation of a small sample of accounts receivable. We conclude the section with some reflections on the modelling process.

### 3.1. The means–ends network

The first stage of the intervention aimed to encourage the decision-maker (one of the co-authors of this paper, who is an experienced factoring analyst) to reflect on the rationale for buying an account receivable and also to display how the aspects he

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