

Study on Non-Deterministic Concepts and Its Application in the Operational Environment Belirleyici Olmayan Kavramlar ve Operasyonel Ortamda Uygulaması Üzerine Çalışma

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ABSTRACT

Non-deterministic concepts and its usage in the operational environment of the microfinance institutions that are categorized by doubt, obscurity, information asymmetric or ignorance between other factors are discussed in this paper. It is crucial for the viability of the microfinance institutions to manage these factors. Therefore firstly, it analyses a main factor of non-determinism as well as description of the theoretical points in the underpinning concept. These microfinance institutions directing this analysis in the operational environment of the microfinance institutions is considered on projects, plans and portfolios financed. Secondly, the applied tools like sensitivity analysis, impact analysis, risk analysis and likely procedures that can be utilized to control non-deterministic elements in the usage text of microfinance institutions are analyzed by it. Thirdly, better operations that might paid attention for managing non-deterministic elements and their influence on the sustainability of these institutions are discussed. In conclusion, the regulatory significance of these institutions of operating the business continuity tools is highlighted in the present paper to confirm the sustainability of the microfinance institutions.

Key Words: Non-determinism, microfinance institutions, business continuity, project management, information asymmetry, risk, ambiguity, ignorance, and uncertainty.

ÖZ

Bu yazıda şüphe, belirsizlik, bilgi asimetrikliği veya diğer faktörler arasında cehalet olarak kategorize edilen mikrofinans kurumlarının operasyonel ortamlarında deterministik olmayan kavramlar ve kullanımı tartışılmaktadır. Mikrofinans kurumlarının bu faktörleri yönetebilmesi için yaşayabilirliği çok önemlidir. Bu nedenle ilk olarak, determinizmin ana faktörünü ve aynı zamanda temel oluşturan kavramdaki teorik noktaların tanımını analiz eder. Mikrofinans

kurumlarının operasyonel ortamında bu analizi yönlendiren bu mikrofinans kurumları, finanse edilen proje, plan ve portföyler üzerinde değerlendirilir. İkinci olarak, mikrofinans kurumlarının kullanım metinlerindeki belirleyici olmayan unsurları kontrol etmek için kullanılacak duyarlılık analizi, etki analizi, risk analizi ve olası prosedürler gibi uygulanan araçlar analiz edilmektedir. Üçüncü olarak, deterministik olmayan unsurların yönetilmesi için dikkat edilebilecek daha iyi operasyonlar ve bunların bu kurumların sürdürülebilirliği üzerindeki etkileri tartışılmaktadır. Sonuç olarak, iş sürekliliği araçlarını çalıştıran bu kurumların düzenleyici önemi, mikrofinans kurumlarının sürdürülebilirliğini doğrulamak için bu makalede vurgulanmaktadır.

Anahtar Kelimeler: Belirsizlik, mikrofinans kurumları, iş sürekliliği, proje yönetimi, bilgi asimetrisi, risk, belirsizlik, cehalet ve belirsizlik.

Introduction

Failure of international aid to reduce poverty in developing countries (1), has called for concrete actions to combat this scourge. United Nations (UN) agencies, institutional donors, non-governmental organizations, development aid practitioners and academics are beginning to question the existing pattern on which such aids are formulated (2, 3). As a result, stakeholders have been interested in a new tool that will help address poverty issues in developing countries. This tool is symbolized by microfinance institutions (MFIs) (3) which are intended to grant smaller loans directly to poor people in developing countries to finance projects (1, 4). Nevertheless, granting loans in most cases is subject to guarantees in the absence of credible information that can be used to assess the creditworthiness of the potential borrowers(4). To that extent, the lack of adequate information surrounding funded projects raises issues coined as information asymmetric (5). Information asymmetric is characterised by the lack of adequate information (asymmetry) that will help assess qualified projects quality and the borrowers' capacity to eventually repay the loans(6). To face these challenges, the MFIs need to adopt tools and mechanisms to manage non-deterministic factors that might have an impact on their sustainability (3). There are, however, many papers in project management that have addressed aspects of non-determinism from the perspective of uncertainty, risk, or ambiguity (7-11). These non-deterministic concepts are integrated into general approach of project management as key success factors of the project at best. In the case of MFIs, traditional management and governance dimension of single project is moved to multi-project management considerations symbolized by the multitude of credits granted (12, 13). This operating environment specific to MFIs demonstrates that the elements of traditional controls and governance namely, planning and control of such projects cannot guarantee their sustainability. Although this traditional project management is not to be neglected, it is vital to see the management techniques considering non-deterministic concepts (14). This consideration makes sense insofar as these MFIs operate in a multi-project or portfolio environment. Moreover, the problem of managing the notions of non-determinism is more related to risk management (15) instead of uncertainty management which is more appropriate for this industry. Based on this observation, the article aims to highlight the other dimensions of non-determinism in order to help practitioners of microfinance institutions to take a much more comprehensive approach to considering the non-deterministic concept. To that extent MFIs must manage their projects based on inaccurate information (5, 14), reason being, the following questions are raised in this article namely: • How is non-determinism treated in project management? •How does the treatment of the concepts of non-determinism affect the management of projects? In order to answer these questions, we propose a conceptual framework that takes into consideration factors that influences non-determinism. Amongst other factors that impact non-determinism, and far from being exhaustive, we can cite: • Traditional constraints such as cost, time, quality; and • Different stakeholders with their sometimes-different

expectations and goals. In this article we first explore the concept of non-determinism in the dynamics of project management; and second, we address different approaches proposed in the theory to explore the treatment of non-determinism by the institutions of microfinance. Lastly, we discuss the current practices of managing information asymmetry by MFIs and conclude by highlighting the importance of considering non-determinism in project management, program management and project portfolios. (16).

Non-determinism in multi-project management

Managing projects financed by MFIs is a foremost challenge facing these institutions in order to ensure their survival (3). These projects are subject to several imponderables. The assessment of these imponderables and incidentally their considerations in decision-making mechanisms are intended to circumvent issues related to risk of default which is undeniably harmful to the sustainability of the MFIs. The evaluation of these projects is subject to the quality of the information received from project promoters; and this information may be uncertain, imprecise, ambiguous or fuzzy (Azondékon, 1991) (17). These concepts of uncertainty, vagueness and ambiguity underlie the quality of information needed to make decision in operational dynamics of the MFIs. This operational context is referred to as non-determinism and it is dominated by the inaccuracy of information that informs decision-making in managing projects financed by MFIs (14). Moreover, non-determinism which characterized the asymmetry of information inherent to projects funded by MFIs. Considering and managing these concepts may help MFIs to deliver on their financial and social objectives, and failure to do so could be detrimental to their survival. Several authors who have worked on these issues specific to MFIs have approached this concept of non-determinism from the angle of risk or uncertainty while ignoring the other aspects of non-determinism that are difficult to model (Tchuigoua and Nekhili, 2012 (14), Hugon, 1996 (18), Lanha, 2002 (5), Gale, 1990 (6). Azondékon (1991) (17), in his works presents a typology of non-determinism articulated around three main concepts namely; uncertainty, ambiguity and imprecision. This typology reflects the issues related to the treatment of information that underlies the nature of the activities of MFIs. Thus, in the following section, we will discuss the different components of this typology of non-determinism and their consideration in the context of multi-project management.

Typology of non-determinism

According to Azondékon (1991) (17), the study of the non-deterministic concept is necessary as we are confronted in our daily life to these notions of uncertainty, vagueness and ambiguity, amongst others. MFIs are nonetheless spared. They operate in an environment where information required to make appropriate decisions is simply incomplete at best and non-existent in some instances. Clients of the MFIs are in many cases unable to produce the information in any form whatsoever. And this information might be characterized in different shapes and forms that is needed to clearly identify their category or type. To that extent, the typology specified in our paper is based on works of Azondékon (1991) (17) and Rizzi (1981) (19) that make a clear distinction between uncertainty and inaccuracy. For these scholars, uncertainty is caused by the absence of assessment of the contributing factors to a given action which in our case represents the funded projects resulting in the difficulty to predict any outcomes or consequences that may arrive. This reading of uncertainty is shared by Klir & Folger (1988) (20) who also clarifies the notion of uncertainty in binary form, namely vagueness and ambiguity. Thus, we will address in the following subsections the concepts that make up non-determinism such as uncertainty, ambiguity and imprecision.

Uncertainty

The concept of uncertainty addressed in the dynamics of project management is for the most part likened to risk and it is characterized by the imperfection of knowledge associated with the realization of the project. Teixidor (2006) (21), Bräutigam et al. (2003) (22) distinguish two types

of uncertainties: endogenous (firm-specific) and exogenous (non-firm) uncertainties. This paradigm is explicitly binarized by Smithson (1989) (23) in the form of "possible" and "risk"; and the link between these two concepts forces many academic to differentiate the risk of uncertainty (Knight 1921 (24), Keynes, 1937 (25)). The distinction made by these two authors joins Azondékon (1991) which clearly indicates that the risk starts from a situation of partial uncertainty characterized by subjective probabilities as opposed to the objective probabilities resulting from more reliable source of information obtained from empirical data or experiences. As for total uncertainty, Azondékon (1991) (17) and Smithson (1989) (23) report the proven lack of any information of a probabilistic nature. This fine tuning makes it possible to speak of uncertainty with a great deal of nuance, and Azondékon (1991) (17) qualifies in work this dynamic of partial uncertainty as an ambiguity.

Ambiguity

Fisher (1999) (26) refers to ambiguity as *prima facie* in the absence of knowledge and is characterized by lack of evidence supporting a description or assessment of an event. Thus, he tells us that the lack of required information for evaluating of such events constitutes an "absence". Absence is related to situations with unspecified alternatives. Non-specificity is translated by the plurality of meanings associated with a relationship or event or when the scale of the analysis is likely to lead to multiple interpretations. In that sense, Azondékon (1991) (17) evokes non-specificity as partial information of a probabilistic nature (partial uncertainty). For this reason, it is treated halfway between uncertainty and inaccuracy, which is referred to as a concept of vagueness in the next subsection.

Vagueness

Azondékon (1991) (17) proposes that vagueness is a form of fuzziness and is caused by willful ignorance of the unknown factors that influence the evaluation on the one hand; and the ignorance of certain potentially new actions impacting the decision on the other hand. And more clearly, he enumerates the causes of vagueness in these terms: "(A) the use of approximate values in the evaluation of events in order to limit the cost of data collection; b) willful ignorance of the impact of the parameters considered as secondary and the use of approximate formulas for the sake of simplification; and (c) lack of knowledge of certain potential actions that present the decision-maker with novelty." (P 26) (17). These situations reflect the difficulty in formulating knowledge distinctly, because the object of so said knowledge is not sufficiently defined. Consequently, a situation under "ignorance" implies that neither the results nor the probabilities are known. However, Smithson (1989) (23) makes a clear segregation by polarizing "ignorance" under two opposites namely "error" and "inadequacy". The "error" refers us to the gaps that underlie our diverse knowledge. As for the "inadequacy", it declines it in "nonsense", "taboo" and "unspeakability", terminologies that determine of an opinion related to an event which is not correctly defined; and which is difficult to evaluate by applying a stochastic approach. Dealing then with ignorance becomes important to decision-makers, and Fisher (1999) (26) mentions that ignorance of the decision-maker in this respect is detrimental to the assessment of the event as it assumes that the required information is not probabilizable. Uncertainty, ambiguity and vagueness highlight different interpretations of non-deterministic situations and their treatments are discussed in the next section.

Considering non-determinism

Treatment of deterministic and non-deterministic information consists of determining the impact of contributing factors leading to optimal decision-making. It uses several concepts and theories that mobilize the use of stochastic tools and fuzziness like the theory of possibilities, fuzzy sets, probabilities or approximate sets to name just a few. About the typology adopted, the treatment of uncertainty will be done using stochastic tools, that of ambiguity by means of stochastic and fuzzy tools and finally that of vagueness by means of fuzzy. Thus, referring to Azondékon (1991)

(17), in order to deal with non-determinism, necessitates discounting the otherness of different approaches by focusing on the sensitivity analysis tools. This general way of dealing with problems of non-determinism concurs with Rizzi (1982) (19) position on the issue. He recommends dealing with vagueness as improbable and suggests its treatment with fuzzy set theory. For the imprecision, Zadeh (1965) (27) also recommends the theory of fuzzy sets characterized by a function whose boundaries are defined in the interval [0,1]; and which according to him is a step towards a rapprochement between the precision of classical mathematics and subtle inaccuracy of the real world. Other authors like Martel et al. (1986) (28), and Urli (1989) (29), suggest less fundamental consideration of the question in the form of randomness and inaccuracy. For the scholars, the line of demarcation between these different notions of non-determinism is vague and ambiguous, and consequently these forms can be found within the same problem. Referring to the different definitions of the components of non-determinism, the appropriate treatment will be to treat uncertainty with the tools of probability theory. As for the vagueness, we will align ourselves with the recommendation of Zadeh (1965) (27) by approaching it with the theory of fuzzy sets. As MFIs operate fundamentally in the environment, it will be important to contemplate the approach used by these institutions to take in consideration non-determinism.

The treatment of non-determinism by MFIs

Theoretical principles that underline solutions for dealing with non-determinism are not exhaustive; however, they shed a light on methods used in manipulating imperfect information in the context of projects (16) financed by MFIs. Considering the operating environment of MFIs and their obligation for profitability on financed projects (14, 15) require treating information asymmetric as key determinant to the survival of these institutions (13). Thus, the following subsections will address the theoretical considerations that underpin the treatment of non-determinism in general as well as tools for specific treatment of the operational context of MFIs.

Theoretical considerations: To avoid instances of defaults, the information provided by project owners becomes crucial and it constitutes the main parameters to assess the quality of the project. In the context where socio-economic environment is characterized by poverty, information provided by the project owners is at best incomplete, imprecise and at worst non-existent (17). Anticipating future cash flow becomes uncertain or impossible in this dynamic that solicits the use of principles of the financial theory of expected utility (14). In an uncertain environment where it is difficult to anticipate future cash flows generated by the return on these projects, it goes without saying that non-determinism should be considered to determine the probability of the contributing factors that are used to assess these projects (13). MFIs will then assign a probability of realization to different future cash flows where projects must be selected if the discounted cash flow expected is greater than the initial investment (6). The use of the Bayes theorem, through the development of decision trees, will allow for the integration of the impact of this approach in the decision model. Situations where probability cannot be determined, decision rules such as Laplace model (equiprobability), Wald criterion (MAXIMIN), Hurwicz criterion (MAXIMAX) and Savage criterion (opportunity cost - regret) make it possible to select a project to finance. The use of these rules to consider non-determinism will make it possible to determine the opportunities and consequences associated with the projects to be financed (17). More specifically, the evaluation of the impacts of non-determinism in a portfolio context, as is the case in MFIs, will require the use of tools such as: sensitivity analysis, analysis of impact and risk analysis.

Sensitivity analysis: Tools mobilized to conduct sensitivity analysis will make it possible to anticipate the consequences that projects that are financed will have an impact on the performance of MFIs and, incidentally, on business continuity. The analysis is done by evaluating the marginal value of the parameters incorporated in the evaluation of the projects to be financed; and by varying at one time only one of the parameters. This approach allows one to target the parameters

that have more effect on the project to be financed. The expected net present value (EVAN), the coefficient of variation, the decision trees, the Monte Carlo simulations are tools that can be used by MFIs to reduce the level of default related to their activities (30). These tools are more suggested in the context of ambiguity or vagueness. Accordingly, the next subsection dealing with impact analysis makes it possible to deal more with the treatment of uncertainty where there is some knowledge of the probability distribution surrounding the projects that will be financed.

Impact analysis: Impact assessment is used where uncertainty regarding the financing decisions of the projects is determined; and it is used to compare alternative scenarios related to project returns and especially to the repayment capacity of the borrower among others. Consequently, assessment implies consideration of one or more variables at the same time as opposed to sensitivity analysis where variation takes place at the level of a single variable. The tools mobilized in this case will help to grasp the real impact on the profitability of the projects to be financed. Financial tools to measure profitability such as NPV (net present value), IRR (internal rate of return) or ROI (return on investment) are mobilized in the impact assessment (30). This impact assessment can be congruently associated with situations where knowledge about actions is incomplete or imprecise, because not all contingencies can be linked to a probability distribution. This situation called for risk analysis that is discussed in the next subsection.

Risk analysis: A risk analysis is necessary when variables of non-deterministic environment are linked to a probability. To that extent, high probability situation having negative effects on the possibility that the profitability of the project will occur posteriori of the determination, the risk analysis will be mobilized as a tool for assessing the probabilities of occurrence, and magnitude their impact on the result (30). This analysis can help determine the degree of borrower default (14). Other risk analysis tools, such as the decision tree, can also be used in the management of non-determinism in the operational context of MFIs. Considering these theoretical tools for managing non-determinism, the next section of the article will focus more on the current practices adopted by MFIs to manage non-determinism.

Non-deterministic management practices in microfinance institutions

The consideration of non-determinism in microfinance institutions focuses mainly on information asymmetry management mechanisms where regulatory bodies provide some guidance in that regard. MFIs treat the asymmetry of information by using either risk management techniques or business continuity principles.

Current practices of managing information asymmetry in MFIs: Non-determinism in microfinance institutions is mainly characterized by asymmetric information that refers to the concepts of risk and uncertainty (Tchuigoua and Nekhili (14), 2012, Hugon (18), 1996, Lanha, 2002 (5), Gale, 1990) (6). These concepts indicate that one of the actors in the relationship has better information than the other and this contravenes the assumption of information transparency in pure and perfect competition (16). Imperfect information in this setting refers to the problem of adverse selection (6, 15, 16) where MFIs do not fully understand the likelihood of success of the project owners. As per Gale (1990) (6) points out, this situation leads institutions to offer high interest rates to cover the default risk that in turn leads to limited coverage of the market needs. Lanha (2002) (5) also discusses the lack of credit bureau, unstructured economic environment and inadequate skills of key stakeholders as aggravating factors of information asymmetry. To overcome these impediments, business continuity methodology is used as a mean to treat non-deterministic issues.

Business continuity as a non-deterministic management tool: The environmental contexts in which MFIs operate require the use of much more stringent accountability rules to ensure the transparency of their activities (3, 4, 31). These accountability rules focus on the accounting assumption of going concern that is related to business continuity used as tools for practical management of non-determinism (32). Indeed, this concept is addressed in the literature according

to the managerial perspectives affecting several fields of activity such as information technology, financial and accounting institutions (33, 34). In this respect, the theoretical perceptions underpinning business continuity in management are essentially based on decision support theory (35) and many scholars argue that going concern is a simple mechanism centered on the management of operations and processes (32, 36, 37). The notion conveyed by this concept is to better prepare for effective business resumption after an event occurs, it is suggested that the business continuity component be included as a risk management plan (38). It becomes a tool for managing non-determinism and help leaders make appropriate decision about their business. For that reason, regulators exert more oversight on these entities as the severity of the crises may contribute to the failure of these institutions (38, 39). The systemic effect of these financial crises leads to the establishment of business continuity management mechanisms and tools in financial institutions and predominantly in the MFIs, regardless of their size and location (40, 41). The harmonization of accounting standards and prudential regulations plays a crucial role in this awareness (42). However, the fact remains that this harmonization is applied unevenly according to the state of progress of the knowledge of the various actors in the field. This harmonization is also confronted with the problems specific to the laws in force in each geographical zone. Another major challenge is to integrate all the dimensions of non-determinism into the use of this tool, which is the continuity of exploitation (43).

Conclusion

This article focused on mechanisms and tools for managing non-determinism in the microfinance institutions. Using decision support theories in the literature (17), this paper examines non-deterministic management tools that focus on the principle of going concern (44). Given the environmental context in which the MFIs operate, the effective management of the non-deterministic variables is therefore a crucial issue that has a proven effect on the sustainability of these institutions. This becomes essential as prudential regulatory bodies and stakeholders with a recognized interest in the management of MFIs' operations require better support for the concepts of non-determinism. Thus, beyond the practical aspect of some of these tools, the one that focused on the continuity of operation must really help to face the problem of the resilience of the MFIs. It goes without saying that the answer is more shaded because mastering these tools constitutes a brake which will of course have an impact on the durability of the MFIs. Overall, project owners and the institutions must address together the information asymmetric issues that have an impact on the sustainability of the MFI.

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