

Entrepreneurial Decision Under Risk and Uncertainty

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Abstract: *Entrepreneurial decision is always subject to a significant level of uncertainty. Uncertainty is related to human nature and it is the most significant reason for economic action. This paper explains the most important challenges for economic decisions due to different forms of uncertainty associated to it. The paper highlights why uncertainty is important for economic decision and which are the limits of risk management strategies proposed for dealing with such uncertainty.*

Keywords: uncertainty, risk, risk management, entrepreneurial decision, case and class probabilities

Introduction

Men are different to animals or plants due to specific characteristics: there is a clear specialization of man in producing goods and services, involvement in exchanges of goods and services and social cooperation. Consumption of goods and services is impossible without existing resources for doing this (capital goods or intermediary goods). Consumption could be the result of someone's own production (e.g., personal harvesting for natural resources) or the result of exchange between own produced goods and others' goods. These exchanges could be direct ones (bread for milk) or indirect (bread for money and money for milk). The role of money is to facilitate the exchange of goods and services and any quantity of money is sufficient to provide this specific function (money are never neutral in facilitating such exchanges). Without money, the economy will remain a rudimentary one, being impossible for entrepreneurs to develop very complex production processes with so heterogeneous intermediary goods. Money facilitated the relative prices of any final or intermediary goods and provided significant driving support for entrepreneurial actions. Replacing the natural money (derived from the best commodities from the market as being used as medium of exchange rather than industrial or consumption good) with legal or politically controlled money

(produced out of nothing without significant costs), the entrepreneurial error was significantly increased.

Entrepreneurial decision is one of the most complex human actions. The entrepreneur is always acting in the future (not in the present and not in the past), providing the goods and services to the market for obtaining necessary resources for its own consumption. Monetary profits derived from this specific activity are important for buying present or future goods and services from the market. When the entrepreneur is not able to produce alone a good or service for the market, he will hire employees (including managers or business administrators). Managers or other hired people, that are helping the entrepreneurs in their productive process, are not assuming the same uncertainty as the entrepreneurs. They are entrepreneurs only in regard to the work they provided in a productive mechanism. The capitalists are also important for the productive process because they are providing necessary capital goods if the entrepreneurs do not have them. The uncertainty assumed by capitalists is referring only to these capital goods transferred to entrepreneurs in specific contractual conditions.

This paper discusses different types of uncertainty associated to entrepreneurial decision, in order to understand its specific nature and to clarify the role of business strategies in reducing it.

Different levels of uncertainty in entrepreneurial decision

In the common approach, the entrepreneurial decision is facing three different types of uncertainty:

1. *certain situation*: when the outcomes and all the possible factors, including their impact on the outcomes, are known before the decision is taken;
2. *uncertain situation*: when the outcomes and possible influencing factors are not known;
3. *risky situation*: when the decision makers are able to measure somehow the uncertainty. The term of measurable uncertainty (Knight, 1921, p. 233) refers to *a priori* (derived from symmetric actions) and statistical probabilities (derived from homogenous data) that are associated to specific future events and that are calculated by examining the existing information about the occurrence of such events.

Definition of a risky situation is related to the existence of probabilities that ratios or indices that reflect the opinion of a decision-maker on a

specific event. Keynes (1921) described probabilities to be applied not to a proposition but to a pair of propositions (one describing a not known true or false situation and one describing the evidence of the first proposition): "...all propositions are true or false, but the knowledge we have of them depends on our circumstances; and while it is often convenient to speak of propositions as certain or probable, this expresses strictly a relationship in which they stand to a corpus of knowledge, actual or hypothetical, and not a characteristic of the propositions in themselves. A proposition is capable at the same time of varying degrees of this relationship, depending upon the knowledge to which it is related, so that it is without significance to call a proposition probable unless we specify the knowledge to which we are relating it" (pp. 3-4). Keynes was convinced that "the Theory of Probability is logical, therefore, because it is concerned with the degree of belief which it is rational to entertain in given conditions, and not merely with the actual beliefs of particular individuals, which may or may not be rational" (p. 4).

In practice, objective probabilities are difficult to be directly obtained or assessed. These probabilities are associated to frequency of a specific event: in case of a face of a dice, the probability is approximated to a number of throws with this property from total number of throws; similar, for the risk of accident in a cross-road, the number of registered accidents during a specific period (1 year for instance) divided to total number of cars that cross that place during that year will provide the probability of car accidents in that place. Frequency means history of records about a specific event. In the case of deriving the probabilities for a dice game, these probabilities are considered to be *objective* and not sensitive to any personal beliefs. Of course, a young person will have more time than an older one to throw dice on a table and to obtain more relevant history, but we cannot argue that the result obtained for a *sufficient or relevant number of throws* will be different if the dice is thrown in a room or in another, by a different person or in a different moment of the day or the year.

The most important step in the dispute of objective and subjective probabilities was made by Cournot, 1843. According with Cournot principles, objective probabilities are approximated by the frequency of an event derived from experiments or observation and subjective probabilities "*are used for measuring the degree of belief in a statement or a proposition about things or events; they thus refer to our imperfect knowledge or our judgment and not directly to the things or events about which the statements are made*" (see Hald, 2003, p. 245). Ramsey, 1931 connected more clearly the subjective probabilities with personal beliefs saying that "a partial belief cannot in general be connected

uniquely with any actual frequency, for the connection is always made by taking the proposition in question as an instance of a propositional function. The pretensions of some exponents of the frequency theory that partial belief means full belief in a frequency proposition cannot be sustained.” (pp. 25-26). de Finetti (1968) defined probability as “means degree of belief (as actually held by someone, on the ground of his whole knowledge, experience, information) regarding the truth of a sentence, or event E (a fully specified ‘single’ event or sentence, whose truth or falsity is, for whatever reason, unknown to the person)” (p. 45).

An example of this subjectivist approach on the probabilities is provided by Ellsberg (1961): somebody will introduce in an urn 10 balls red and 20 balls that could be black and white coloured; Ellsberg proposed four different lotteries for different combinations of three colours that could be extracted from the urn. The idea is that probability of red colour is certain to be $1/3$ (it is certain that in the urn 10 balls out of total 30 balls are red). The probability of black coloured balls is in a range between 0 and $2/3$, depending on the behaviour of the person that will prepare the urn for the extraction (the perception about how many black balls will be included in the urn is important in this case). The same is with white coloured balls. Therefore, a combination of all three colours offering different bets of different colours will not offer a clear known probability. This probability is considered to be subjective because the personal beliefs on the combination between white and black balls from the total of 60 will influence the action of the gambler. Allais (1953) argued that “Certaines personnes qui ont confiance en leur étoile sous-estiment la probabilité des évènements qui leur sont défavorables et surestiment la probabilité des évènements qui leur sont favorables. C’est l’inverse pour les personnes qui s’estiment poursuivies par la malchance. Il y a ainsi une déformation subjective des probabilités objectives. La probabilité objective d’un évènement doit être entendue comme une grandeur dont la fréquence observée de cet évènement est la mesure expérimentale. On peut distinguer la fréquence estimée expérimentalement, ou probabilité objective, et la fréquence estimée psychologiquement, ou probabilité subjective” (p. 508).

In fact, it is very difficult to distinguish between objective and subjective probabilities. This can be defined only by taking into consideration only the personal *a priori* beliefs or psychology of the person that is considering the frequency of an event. For instance, it is interesting to argue about why the personal beliefs on the “*imperfections*” of the dice are not important for estimating the frequency of the face 1, in case of a dice game. Personal beliefs

are always present in the determination of any type of probabilities and could not be useful for such distinction. We have personal beliefs on everything, including probabilities (objective or not).

A better distinction for the theory of decision is the distinction between class and case probabilities (both of them being objectively determined and depending on the beliefs of the decision-maker). This distinction was firstly consistently defined by Mises (1998): “Class probability means: We know or assume to know, with regard to the problem concerned, everything about the behaviour of a whole class of events or phenomena; but about the actual singular events or phenomena we know nothing but that they are elements of this class... Case probability means: We know, with regard to a particular event, some of the factors which determine its outcome; but there are other determining factors about which we know nothing.” (see p. 107 for the definition of class probability and p. 110).

Case probabilities and class probabilities are about what “*we know or assume to know*”, so personal beliefs on what we know about a class or a particular event are present in our assumptions. The difference between class probabilities and case probabilities are important for understanding the nature of uncertainty: class probabilities are independent of time and place and the frequency determined from the experiment could be extended to any event from that class and case probabilities could be extended to a similar event with error. Case probabilities are sensitive to time and place of determination. For instance, in case of a dice or in case of a car accident in a specific cross-road we can use the experiment to determine a frequency of a specific event (“face 1” from the dice game or a “car accident”). But in the first case (dice game), the frequency is not dependent on the time or on the place of determination, so the results could be extended to any similar event that will take place at a different time or in a different room (the probabilities will be assumed to be equally without relevant error). In the second case (the car accidents in a specific cross-road X), the frequency could be extended to a different year or to a different close cross road but with significant error (in cross-road Y with similar characteristics the frequency of accidents could be significantly different during the same year). For more complex situations (entrepreneurial decisions) the probabilities will be more sensitive to time and place due to fact that there is not a class of events that could be grouped to calculate a reliable frequency. The inclusion in a class of events for such complex situations is very problematic. In this case personal beliefs are always present, the probabilities (class and case ones) are always objectively determined (are always present in

the entrepreneurial judgment) but more or less relevant to be extended during time or space. It is a problem of personal beliefs to consider that the dice is biased and to refuse to extend the results to a similar event or to consider that the daily sales of a company on the market are identically events that could be included in the same class of events and to calculate the frequency to approximate the probabilities. The number of relevant throws (for dice game) or periods (for business sales) is depending on the personal judgment of the observer. It is sensitive to personal beliefs too.

Probabilities could have a numerical expression (as a percentage with range between 0% and 100%) or a non-numerical expression (“more” or “less” probable). When the probabilities are *a-priori* determined we can call them *theoretical probabilities* (for instance in case of a dice). Theoretical probabilities could be numerical but also non-numerical too.

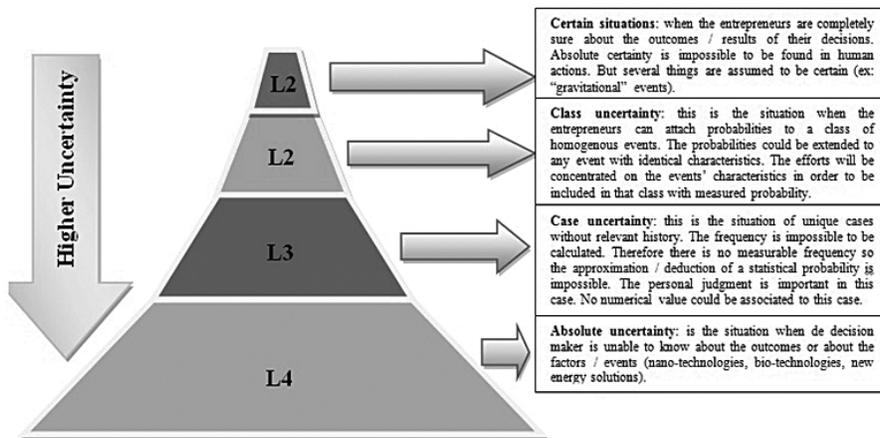


Figure 1. Different levels of uncertainty associated to economic decisions

Taking into consideration this distinction between class and case probabilities that is more relevant than objective and subjective ones we can distinguish between four levels of uncertainty that could be associated to entrepreneurial decision:

Level 1: Certainty – In fact, the absolute certain situations are very rare in practice (“death or taxes” are certain in a trivial approach). Certainty is commonly associated to events / decisional situations that are totally based on Physics, Biology or Chemistry principles (so-called natural sciences). Taleb, 2010 called them “gravitational” events, connecting them with the

law of gravity. These events are not social ones and are connected with the physical properties of things. The resistance of a suspended bridge to different factors are based on very exact measures that will provide a certainty to its construction and operation. We have a lot of things that are surrounding us that are submitted to function without so many surprises (when we are opening a TV we are certain that this device will not explode in our face). This certainty is not absolute or perfect. Something could go wrong and the problem could occur (the bridge could not resist to a wind or an earthquake, the TV could be damaged by a variation in the electric intensity). But, in entrepreneurial decision, these situations derived from the physical properties of the environment are considered to be (almost) certain. The experiment is also important to improve the properties of a specific device and to make it safer for the users / consumers.

Level 2: Class uncertainty – This decisional situation could be associated to gambling or dice games. In this case, we can use the experiment to calculate the frequency that will approximate the probability. The probability is objectively determined and it but the personal beliefs on it will not affect the objectivity of such determination. The events that are included in the class have the same known properties. When we have an event with the properties of a class will have automatically the probability of that class. This probability is a theoretical one. This probability is the same if the determination will be made at a different moments of time or in different place (throwing a dice will return the same probability if the determination will be made in a different daily moments or different places; the person that will throw the dice will be not relevant too; the colour of the dice will not matter and if the dice will be made from different materials it is suppose that will not matter too). The experiment is possible too. The distribution of events is known before. The measure could be improved by adding new observations / events in the class or group.

Level 3: Case uncertainty – In the common approach, the subjective uncertainty is associated to those events that are connected to human actions / behaviours. Car accidents are depending on the skills and reactions of drivers entering in a specific cross-road. Sales of a company are depending on the consumer's behaviour or on the reaction of competitors. In fact, "the daily sales of a specific good" or the "car driving in a crossroad" are always unique events. We could treat such events as being included in class of homogenous events ("car accidents" in general, "sales" in general) or we could consider them to be a unique case. By considering that the historical sales of the company is similar with the case of a dice game is erroneous. It is not the same situation.

On the other hand, the sales of today are not quite totally unique because the entrepreneur has a consistent history of daily sales of the same product, in the same location. The entrepreneur will include these sales in the same class of events with an error. This error could be very significant in many cases. If the entrepreneur will be not confident in the frequency that is obtained by considering “daily sales” as homogenous events, he will consider that event to have a probability that could not be determined by using the frequency methodology (that is valid only for a class of events) and that have no numerical shape. This situation is similar with the situation when in an urn it is introduced a known number of red balls (30 balls) and other 60 balls with two known colours (white and black) but the proportion of balls is unknown. There is no class probability to be assigned. The probability is known within a range for white or black balls (between 0 and 2/3). In this case, the decision maker will use his personal judgment evaluate de unknown proportion between white and black balls. He could study a history about the behaviour of the person in charge with loading those 60 white and black balls in the urn ant to consider it as a class of events. But the frequency is, in a sense, irrelevant in this case in providing more useful information than the known information about the fact that the probabilities could be within a range. In some situation, the number of red balls is higher and in other cases is much reduced compared with the coloured balls that could be randomly introduced in that urn. In many cases, the number of colours that could be randomly introduced in the urn is higher than two colours, so the possible combinations are more complex. In other cases, the persons that are introducing the unknown balls in the urn are different and independent in their behaviour (each person could introduce two different colours each). Almost all entrepreneurial decisions are assigned to face with this kind of uncertainty. Running experiments to measure or to test the frequency is very problematic. Frequency of probability determined for such unique events is a non-sense. You have no distribution of events because you do not have a class / group of similar events. History / observations will not improve the situation because it refers only to non-identical or non-similar situations.

Level 4: Absolute uncertainty – It is the situation when the decision maker will not have the possibility to measure the uncertainty using probabilistic approach. This uncertainty is associated to biotechnologies, the discoveries of the space (going on Mars for instance), nanotechnologies etc. The novelty of such activities is to explain the impossibility of knowing the possible outcomes or consequences. Absolute uncertainty or chance is present in many technological findings that changed our existence:

1. often we are developing a research without knowing the future use of discoveries we have made (the example of Internet) and,
2. many discoveries are made purely by chance after many years of researches and after important resources have been consumed (the example of dynamite discovered by chance when a bottle of nitro-glycerine was dropped off the truck on the ground of the factory and the contend was mixed with the sand).

The observation could be very confusing for everybody: the uncertainty associated to the starting and developing of a business is higher and different than the uncertainty associated to gambling. We are forced to assume this higher uncertainty because we need to produce and to sell goods and services in order to obtain necessary resources to consume. Knight (1921) simply observed that the entrepreneurial decision: “deal with situations which are far too unique, generally speaking, for any sort of statistical tabulation to have any value for guidance. The conception of an objectively measurable probability or chance is simply inapplicable...” (p. 231).

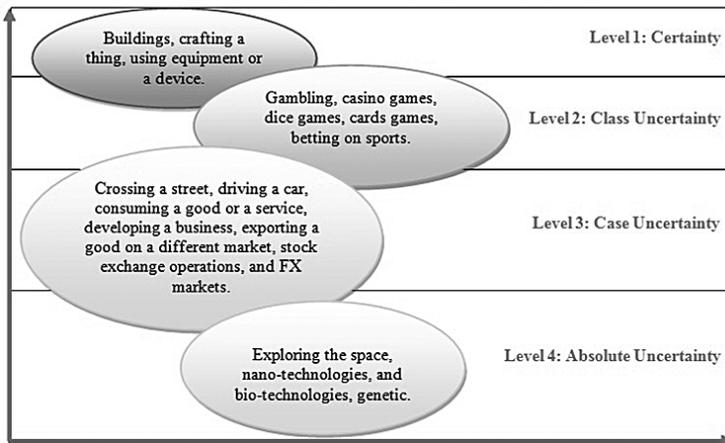


Figure 2. Human actions under uncertainty

Looking to the fact that almost entrepreneurial decision face with case and absolute uncertainty that is higher than gambling, somebody could argue that is less risky to play the money on a bet game rather than investing them in a business or in a stock exchange. At least, in that bet game (lottery), the probabilities are measurable by using frequency (class probabilities).

The arguments in the favour of business are the following:

1. The probability for lotteries could be very high in the favour of losing money than of winning the bet (for many lotteries the bet is huge enough to compensate the low probability of winning it);
2. Even a person will know the probability of spending money on a casino roulette in a game with two colours only (that is 50% to lose and 50% to win), this information will be problematic and requires personal judgement: the statistician will say only that in 50% of cases there is a chance to win something but he is never able to say if the next spin or throw of the dice is a winning one. The same in the case when a regression model is run and the statistician will provide a 95% probability to an exchange rate higher in the future and 5% to an exchange rate not higher. If I want to know about the concrete situation of tomorrow this will remain unknown until tomorrow. The predictions based on frequency could be (more or less) erroneous or not.
3. Experience and specific understanding, communication with people (customers, suppliers, employees, competitors, legal representatives) could improve the creation of a class of events that could be very reliable for calculating a frequency, in accordance with distribution of values in that class. The improvement of technologies (IT, software, and databases) significantly changes the quality of information for business sector and markets. Best practices and business educational programmes have also an important impact in convincing more people to start a business rather than betting money on a roulette or a dice game.
4. The development of a new economic field of research – risk management – plays also an important role in this balance between betting and investing money into entrepreneurial scheme. Risk management strategies (such as well signed contracts, parallel contracts that will share the uncertainty between more actors, guarantees, derivatives, insurance policies). Nowadays, risk management is a very important domain when an organization intends to start and to develop a new project. The dynamic and complexity of economic environment forced to include this domain among the others in the structure of such entities. Without risk management approach (understanding uncertainty, assuming specific actions and strategies), the projects we are developing could be very affected.

Moreover, the specific uncertainty associated to entrepreneurial actions should be seen as a source of profits and gains. The products and services are impossible to be sold on the market without this uncertainty. The entrepreneurs that will better understand this uncertainty and that will find the most appropriate instruments to deal with it and those that will be closer

with their estimations with the concrete evolution will obtain more profits and will resist to the market. The others will accumulate problems and loses and, finally, will be eliminate from the competition.

On the other hand, we cannot neglect the negative implication of the state intervention on the market. Today, the state intervention in the economy ceased to be a neutral one. Day by day, the political entrepreneurs introduce new market conditions, new rules, new institutions, new taxes and new quantity of printed money. The prices are controlled and strictly manipulated (interest rate, exchange rate). The state is far away from being a simple referee (like in a football game). Finally the economic environment is more and more chaotic for everybody that is still interested to find its prosperity by using sound path. This state intervention is also dangerous for the stimulus that is creating at the level of business sector: the entrepreneurs are more interested to use politicians to obtain contracts or to defend their market position rather than accepting the market competition. Market is considered to be unstable and unfair, an imperfect mechanism for allocating resources in the society. But nobody is able to provide an answer to a simple question: why state intervention in the market is preferable in this case? Why a state composed by “imperfect” public servants should be the key element to correct the market imperfection? In reality, this intervention is a source of profits for such political entrepreneurs. It is sold as providing more stability and fixed prices (less uncertainty) but, in fact, is adding a huge systemic uncertainty to our decisions. Economic crisis generated by this state intervention (autistic, bilateral and triangular ones) is not a source of lower uncertainty. It could never be seen as a panacea to the natural uncertainty that exists in the exchanges of goods and services between private operators.

Management of uncertainty in entrepreneurial decision

Management of uncertainty is very important for entrepreneurial decision and explains why starting a business should be reconsidered as an option for becoming wealthy. This economic field was initially associated with financial operations of a company in the market because the risk manager was a simple administrator of insurance policies signed by the company for particular risks. In practice, more instruments (than insurance policies) have been developed such as: derivatives, guarantees or specific clauses in the contracts (for instance, INCOTERMS in international trade used to share the specific risks of international delivery). Therefore, risk manager became more and more

important in the organizations and assumed more and more responsibilities. The knowledge and competences of risk managers were significantly extended.

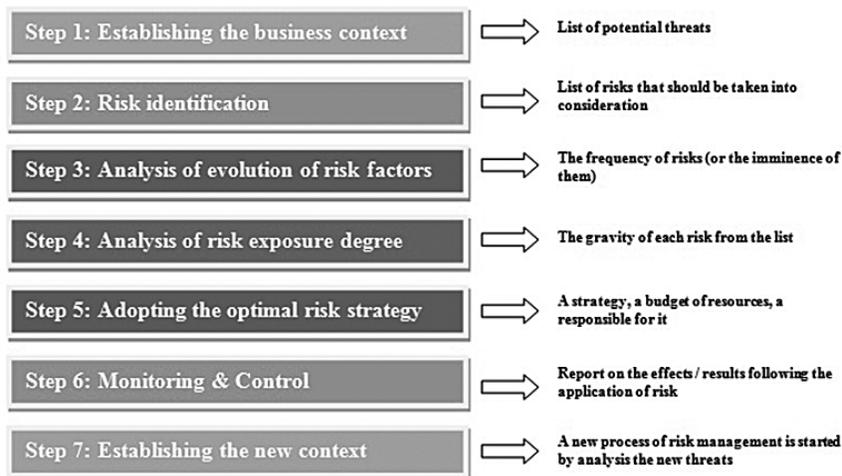


Figure 3. Risk management process (7 steps approach)

Risk management became a systematic process involving specific activities and processes:

- *Establishing the business context*: The risk manager will try to understand the specific of the business decision by looking to the connection with the business environment components (political environment, legal environment, social environment, operational environment, natural environment etc.). All of these components are supporting the identification of risks associated to the decision. More source of risks are derived from the quality of information, limited time for taking it and the personal limits of risk managers in providing an interpretation of that huge and complex set of information;

- *Identification of risks*: Based on the personal experience of managers, an exhaustive list of potential risks associated to that business decision is provided. Questionnaires applied to different specialists, schematic representation of business process, statistical data, financial statements are very useful to complete this step.

- *Analysis of the evolution of risk factors*: After the exhaustive list of risks is produced, the risk managers will start to analyse if the evolution of risk factors. For instance, if the operation will be an export one, there will be a risk of appreciation of local currency against the currency from the export contract. But only appreciation (lower exchange rate in a direct quotation

system) is problematic in this case. So, the specific understanding of exchange rate and its evolution is fundamental. A prediction based on a quantitative approach (trends, autoregressive models, multiple linear regressions) could be used in this case (of course with known limitations). Finally, the manager will obtain a prediction on the evolution of this factor that will indicate the imminence of the problem or the frequency;

- *Analysis of the gravity of that risk:* In this case, the manager will study the impact of specific risks on the business decision. For instance, the same exporter that identified an imminent appreciation of exchange rate will be focused on analysing how much this event will affect the results of his decision. If the export will be based on imports of raw materials, the risk exposure will be lower than in the case when all raw materials are coming from the local market and are paid in local currency. This gravity is very important to be understood by the manager.

- *Establishing the optimum strategy for dealing with uncertainty:* It is the core of risk management process. Based on the assessed gravity and frequency (or imminence), the manager will decide to avoid (if gravity is high and imminence is high) or to neglect the risk (if, in his opinion, gravity is reduced and imminence is reduced). The personal beliefs of manager on assessed risks are very important in this stage. If the manager will consider the risks to be avoided and they are not, very important opportunities could be lost; if the manager will neglect the risks that should not be neglected, important losses could occur. For those risks that have important impact on the decision but the imminence is reduced (or frequency is considered reduced), the manager will decide for transfer the risk through specific contracts (for instance a contract with a company that will guard the production facility), through insurance policies (the risk of accidents, fire risk, earthquake risk), through guaranties (the default risk for instance) or through derivatives (future, options, swaps, CDS). If the gravity is assumed to be reduced but the imminence high, the manager will adopt preventing measures (building a fence around the production facility, labour security measures, protective equipments, devices for video surveillance of the site etc.).

- *Monitoring and control:* The risk management plan adopted in the previous stage should be applied in the organization. The risk management plan should include a budget for its implementation and a person (or persons) responsible for it. The specific results should be associated in order to be monitored and controlled. For instance, when derivatives (future contracts) are used for covering the exchange risk exposure for an exporter, a budget for opening an account to a broker should be established. Because the exporter will fear about a possible appreciation of local currency, the decision will be to open

a “short” position on future market that will ensure a gain for compensating the potential loss in the main contract (export contract). After the position is open in the future market, the manager should continue to monitor the evolution of exchange rate on both markets (FX market and future market). If the local currency will increase (depreciation instead of appreciation), the manager should decide quickly to close the short position of future market in order to reduce the loss from this parallel contract (derived from main export contract).

The entire risk management process will be continued after the risk strategies are decided and implemented. Monitoring and control phase will establish if the business context significantly changed and if the organization need a new risk management plan. The management of uncertainty is a real challenge for each entrepreneur. The approach of uncertainty is an on-going process, requiring important knowledge and resources. Without this specific understanding and approach to uncertainty, a new business will be hardly started by someone.

Concluding remarks

Uncertainty is well present in any entrepreneurial decision because a business is always targeting a group of potential clients that could easily change their mind (they are not automatons with a known and predictable behaviour). At a first sight, developing a business seems to be more uncertain than gambling money in a dice game. In fact, specific understanding, market experience, contracts, insurance, guaranties, derivatives and other preventing measures will significantly reduce the exposure to this uncertainty and will make more attractive business than gambling. Moreover, in gambling nothing is produced for the market. If you want to gamble you need to obtain the resources for gambling before. These resources could be only if you will produce and sell something to the market. Gambling business is also a very uncertain business like the others. The development of casinos is depending on the interest of potential client to this kind of service, like in any other business.

The entrepreneurial decision is submitted to deal with four different levels of uncertainty. The probabilities could be calculated only if we have a relevant class of similar (identical) events. Therefore, the “calculation” of a probability on a unique event is inappropriate. The inclusion in a class of events of assumed identical events (daily sales of a company) could be very problematic.

Personal beliefs are present in any sort of estimation of probabilities (case and class probabilities). The probabilities are objective like any other existing phenomena. The distinction between subjective and objective probabilities is very confusing for entrepreneurial decision and useless for risk management.

The management of uncertainty in entrepreneurial decision is a very well organized process supposing different inter-connected phases. It is an on-going process, continuously applied to a business decision. Ignoring this specific understanding of uncertainty could be a serious problem for the finality of any entrepreneurial decision. This specific understanding is an important source of profits derived from higher business opportunities and lesser losses associated to such uncertain initiatives.

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