# HOW TO CONTROL RISKS? TOWARDS A STRUCTURE OF ENTERPRISE RISK MANAGEMENT PROCESS

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**Abstract**: *In this paper, we try to establish a structure of enterprise risk management process highlighting the steps that a company should follow in order to keep occurring risks under control. The reader will find that risk management process involves five basic stages: setting goals, risk identification, risk evaluation, risk response planning and risk monitoring and control. Risk score matrix decision tree and Monte Carlo simulation are some methods presented in this paper and used to qualitatively and quantitatively analyze risks. For the main categories of risks, we bring in some preventive measures that companies may apply to face risks preserving their competitive advantage on market.*
**Keywords**: *risk evaluation; risk monitoring and control; risk prevention; risk score matrix; Monte Carlo simulation.*

## 1. INTRODUCTION

The XXth century was marked by a significant increase in the international business, the multitude of factors involved in global economic relations determining a lot of specialists to affirm that nowadays business tend to become increasingly risky. The leadership of a successful organization involves in-depth knowledge of the risks that could intervene in business activities as and of how they may affect the attainment of the objectives established by the organization in question.

What does risk and risk management represents?

Till our days, there have been issued many definitions of risk. For example, in Merriam-Webster's Collegiate Dictionary, Eleventh Edition (Merriam, 2003) risk is defined as follows:

„*1*: possibility of loss or injury;

 *2*: someone or something that creates or suggests a hazard;

 *3 a*: the chance of loss or the perils to the subject matter of an insurance contract; also: the degree of probability of such loss;

   *b*: a person or thing that is a specified hazard to an insurer <a poor risk for insurance>;

   *c*: an insurance hazard from a specified cause or source <war risk>;

 *4*: the chance that an investment (as a stock or commodity) will lose value".

As we see, the 3a risk definition introduces the probability concept which we shall found to be significant in risk approaching.

According to the Project Management Institute and its Project Management Body of Knowledge Guide, risk management represents a systematic process of identifying,

analyzing and responding to risks that may occur in a project. This involves maximizing the results of positive events (opportunities) while minimizing the consequences of bad events within a proactive approach to taking control of risks (PMBOKGuide, 2000).

Risk management has the following characteristic features:
- it represents a continuous process, with a dynamic evolution in time;
- it is specifically under the responsibility of general manager and executive management which have to meet the organization's objectives;
- it is settled into practice through an appropriate strategy with the entire company's staff participation at all hierarchical levels;
- it allows the growth of the activities' effectiveness carried out under conditions of risk and uncertainty.
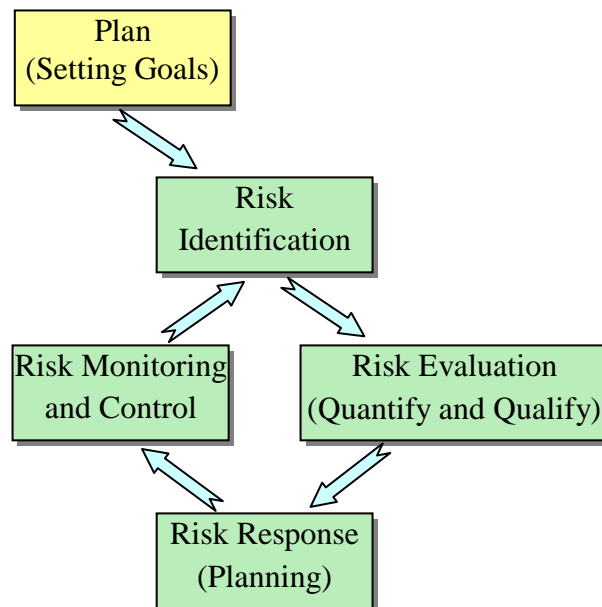
## 2. FUNDAMENTAL METHODOLOGY

Risk management process involves the following five basic stages (McIsaac, 2008):
- Plan;
- Identify;
- Evaluation (Quantify and Qualify);
- Respond;
- Monitor and Control.

The structure of the process of enterprise risk management can be graphically represented as follows:

**Figure 1. Structure of enterprise risk management process**



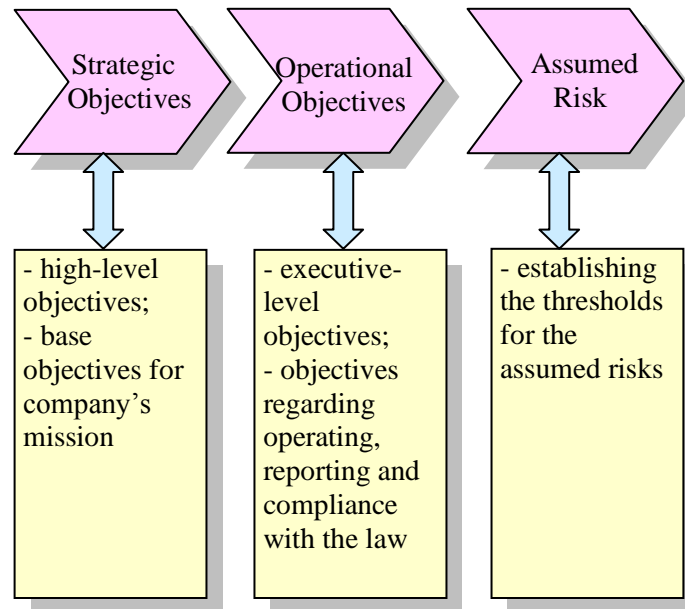*(Source: after Bârsan-Pipu&Popescu, 2003, PMBOK Guide, 2000)*

We shall explain in details the five basic stages of risk management process as follows:

**A. Plan (Setting Goals)**

Before initiating any activities regarding enterprise risk management is necessary to set the organization's goals that must be consistent with its mission but also with the risk quantity, that organization may assume.

Setting goals is a prerequisite for the identification, evaluation and risk response planning having the following structure:

**Figure 2. Setting goals in enterprise risk management**

Strategic Objectives

Operational Objectives

Assumed Risk

- high-level objectives;
- base objectives for company's mission

- executive-level objectives;
- objectives regarding operating, reporting and compliance with the law

- establishing the thresholds for the assumed risks

*(Source: after Friedman&Savage, 1948)*

**B. Risk Identification**

At this stage there are identified the events that could adversely affect the ability of the organization to achieve the settled objectives.

Hazard identification has to be carried out regularly, the organization having to take into account both internal risks (which can be controlled and influenced) and external risks (which are not under the control of the organization).

Risks may be identified by several methods and techniques such as (Bârsan-Pipu&Popescu, 2003) (Cornescu et al., 2004):
- establishing control lists that contain potential sources of risks (e.g. errors and omissions in design and execution, environmental conditions, fluctuation of staff, changes in costs and completion time, etc.);
- applying techniques to collect data: brainstorming, Delphi technique, SWOT analysis;
- use of diagrams: cause-effect diagram, the flow diagram of system or processes, the influence diagrams;

- analysis of the company's archive documents to identify the problems that have arisen in similar situations;
- use of experience of the directly productive staff who often faced risks and problems which the indirectly productive staff did not seize;
- identification of external risks due to changes of laws, of the business climate, etc.

## C. Risk Evaluation

Risk evaluation presumes qualitative and quantitative risk analysis.

## Qualitative Risk Analysis

To develop this kind of analysis, the estimation of probability and impact of risk has to be determined; depending on the results we shall switch to quantitative risk analysis or to risk response planning.

In practice, there are used many methods and techniques for qualitative risk analysis of which we shall present as follows:

a)  probability and impact of risk;
b)  risk score matrix.

*a) Probability and impact of risk*

*Risk probability* represents the possibility of risk in question to occur. To mitigate risks, organizations have to identify the probability of expected events to occure.  (Bârsan-Pipu&Popescu, 2003, Foriş, 2011).

According to *the theory of probabilities*, it is called *the probability* of the event A (designated as P (A)), the ratio between the number m of favorable results for event A to happen and the total number of n results in the experiment, considered equally possible (all results are possible) (Cenuşă, 1999).

$$P(A) = \frac{m}{n} \qquad (1)$$

One of the properties of the probability thus defined is:
$0 \le P(A) \le 1$ whatever the event A is, whereas $0 \le m \le n$.
For the impossible event m = 0, while for certain event, m = n.
In *statistics*, the occurrence probability P (A) for an event A is determined as follows (Cenuşă, 1999):

$$P(A) = \lim_{n \to \infty} \frac{n(A)}{n} \qquad (2)$$

where n(A) is the occurrences number of the event A in the n independent performed tests.

The *risk impact* indicates the effect that risk has upon the organization's objectives if it manifests.

Events with a potential negative impact represent risks that company must manage while events with a potential positive impact represent **opportunities** through which the company can eliminate or reduce risks.

The probability and impact of risk are rated as "very high", "high", "moderate", "low" or "very low".

*b) Risk score matrix*

Risk score matrix is based on combining the probability and impact scales (Bârsan-Pipu&Popescu, 2003).

*The risk probability scale* includes values between 0 and 1 (0 = impossible event; 1 = certain event). A broad scale that is used in this field includes the 0.10, 0.30, 0.50, 0.70 and 0.90 values (0.10 = very unlikely to risk appearance; 0.9 = very likely to risk appearance). The probability scale may also have ordinal values that correspond to the values above: "very unlikely", "unlikely", "medium", "likely" and "very likely".

*The scale of risk impact* reflects the level of risk impact upon the organization's objectives. This scale can be cardinal including values of 0.05, 0.10, 0.20, 0.40 and 0.80, or it may include ordinal values that correspond to those mentioned above: "very low", "low", "moderate", "high" and "very high".

*Risk score* is calculated as follows:

$$\text{Risk score} = \text{Probability} \times \text{Impact} \qquad (3)$$

In order to determine the scores corresponding to each risk there has to be established the risk score matrix:

**Table 1. Risk score matrix**

| Probability | Risk Impact | | | | |
|---|---|---|---|---|---|
| | 0,05 | 0,10 | 0,20 | 0,40 | 0,80 |
| 0,90 | 0,05 | 0,09 | 0,18 | 0,36 | 0,72 |
| 0,70 | 0,04 | 0,07 | 0,14 | 0,28 | 0,56 |
| 0,50 | 0,03 | 0,05 | 0,10 | 0,20 | 0,40 |
| 0,30 | 0,02 | 0,03 | 0,06 | 0,12 | 0,24 |
| 0,10 | 0,01 | 0,01 | 0,02 | 0,04 | 0,08 |

*(Source: Bârsan-Pipu&Popescu, 2003)*

Score < 0,05 – low impact (green color);
0,05 ≤ Score < 0,15 – moderat impact (yellow color);
Score ≥ 0,15 – high impact (red color).
Risks having a moderate or high score will be the first subjects for the quantitative analysis.

**Quantitative Risk Analysis**

Quantitative analysis of risk represents one of the phases that have to be followed in order to evaluate risks that an organization may face while developing its business. This kind of analysis aims to numerical assessment of the probability and impact of each risk upon the organization's objectives.

For this purpose there are used several quantitative techniques such as the decision tree method and Monte Carlo simulation (Bârsan-Pipu&Popescu, 2003).

*a) The Decision Tree Method*

According to Project Management Institute, the decision tree is a diagram that describes the decisions took by the decider and the implications of choosing one or another of the available alternatives. It incorporates probabilities of risks to occur and the costs or rewards (benefits) of each logical path of events and future decisions (Project Management Institute (2000).

By this method, there are represented random events and decisions, as the deciders perceive them.

For each probable future event (represented as a circle) is provided the action (represented as a square) that can be adopted by the decider, resulting a tree structure. Achieving a future event may involve the adoption of one or more paths to follow, the sum of the probabilities for these possible evolutions being equal to one (Dragotă et al., 2003).

**Figure 3. Decision Tree**

Decision Moments
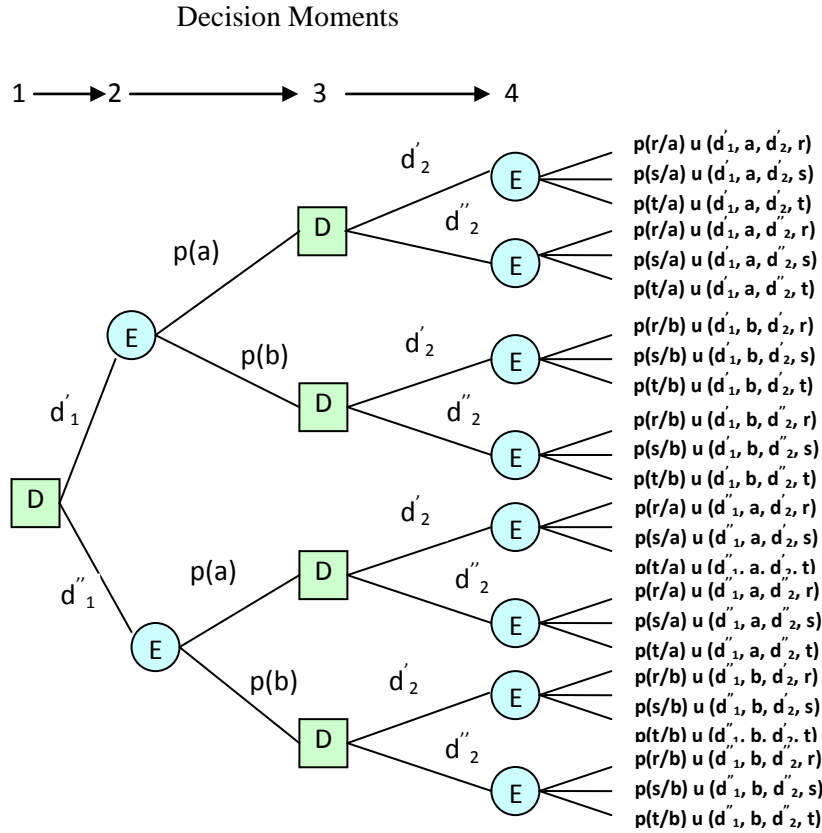


*(Source: after Niculescu&Verboncu, 1999)*

D – decision point;
E – probable event;
u – profit accordingly to different degrees of uncertainty.

Decisions d'1 and d''1 are taken in conditions of uncertainty whereas the choice consequences depend on the probable events E from the time 2, events to whom certain occurrence is not known exactly in time 1. Studies provide probabilities p(a) and p(b) for events E (with variants a and b) to occur in time 2.
The sum of probabilities for each branch linked to a decision must be equal to 1:

$$p(a) + p(b) = 1 \quad (4)$$

Regardless of the choice made at this moment, the enterprise management will have to decide secondly in time 3 when it should opt for the decisions d'2 and d''2. The result of this second decision depends on the event in time 4 whose occurrence is uncertain in time 3. The three final consequences shall be denoted as r, s and t. In case when in time 2, event „a" took place, the probabilities to appear the consequences r, s and t are p(r/a),

p(s/a) and p(t/a). If the event „b" occurs, the probabilities will be p(r/b), p(s/b) and p(t/b) (Nicolescu&Verboncu, 1999).

Therefore, applying the decision tree method, the decider may quantitatively evaluate the risk associated with each decision taken in conditions of uncertainty.

*a) Monte Carlo Simulation*

Monte Carlo simulation represents a technique that performs a project simulation many times in order to calculate a distribution of likely results (Project Management Institute, 2000). By this kind of simulation, risks associated with the events of a system under conditions of uncertainty may be evaluated. Typically, simulation techniques base on the development of a statistics and mathematics forecasting model. Experiments are conducted upon the built model since experimenting on a real model is too expensive or require a long time.

To understand how such a model can be build we shall illustrate a simple one related to investment appraisal and which shows a single relationship between two variables (Savvakis, 1994).

**Figure 4. Forecasting model**
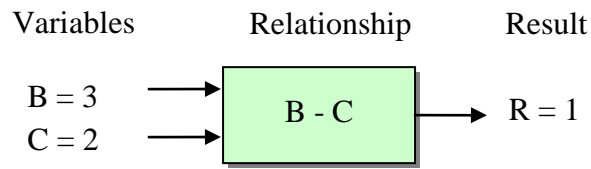


*(Source: Savvakis, 1994)*

Where, B = Benefits and C = Costs.

An efficient forecasting model has to include all relevant variables and to exclude all non-relevant ones using the correct relationships between them.

Within these experiments, questions of interest about business environment may get answers; i.e. the simulation model may reveal answers to "what if" questions (the so-called sensitivity analysis) (Kleijnen, 2004).

To perform a simulation experiment, the following steps have to be taken (Bârsan-Pipu&Popescu, 2003):

- identify the problem which shall be the subject of experiment;
- collect and process the primary data;
- build the simulation model;
- estimate the parameters for the analyzed system;
- evaluate the system performances and test the parameters;
- build the simulation algorithm;
- validate the simulation algorithm;
- plan and perform the simulation experiment;
- analyze the data resulted from simulation;

- take the decision regarding the analyzed system.

Applying Monte Carlo simulation before any real expenses offers the possibility not to incur substantial investment of human and financial resources until the preliminary risk profile of the projects seems to be acceptable. This kind of simulation provides the necessary information that makes possible a more efficient allocation of resources and management of risk within the enterprise.

Nevertheless, there are cases within the costs of risk analysis can be higher than the expected benefit likely to result with the help of this investigation and then such expense is not justified (Savvakis, 1994). It is up to top management to decide which kind of expense to afford and which not.

### D. Risk Response Planning

There are several strategies for risk response and for each risk will be selected the strategy which is most likely to be effective. A main strategy and a backup strategy are selected of the following:

*a) Avoiding risk:*
- Can be achieved by: abandoning or reengineering the activities flow that lead to risk increasing, allocation of additional time and resources, adoption of a conventional know how instead of another one which has not been tested yet, etc.

*b) Risk transfer:*
- it presumes to transfer the risk impact to a third party including the liability of risk response;
- this strategy is most appropriate when company is exposed at a financial risk; in this case, the risk transfer may be carried through assurances, letters of credit, hedging operations (futures and forwards contracts, swaps, etc.).

*c) Decreasing risk:*
- the aim of this strategy is to decrease the probability of risk occurrence and / or the risk impact bellow an acceptable threshold;
- risk decreasing can be achieved by implementing a new means of actions to reduce risk such as adopting less complex processes, conducting additional tests, etc.

*d) Risk approach:*
Risk may be approached in an actively or passively way.
*Active approach of risk* involves the establishing a backup plan to be put into practice when the risk occurs; through this plan it can be significantly reduced the cost of the necessary measures to counteract the negative impact of risk.
*Passive approach of risk* is when the organization does not apply to measures to counteract the risk before its occurrence, preferring to approach risks as they occur (Bârsan-Pipu&Popescu, 2003).

### E. Risk Monitoring and Control

*Monitoring* focuses on the status of risks while checking the actions taken to mitigate them.
*Controlling* risk presumes to correct the deflections from the planned response actions to risk and to improve the processes of risk management.

Risks monitoring and control have to perform permanently throughout the life cycle of a company.

The purpose of risk monitoring and control is to determine whether:

- risk responses have been implemented as planned;
- the effectiveness of the response actions is the expected one or there have to be established new responses to risk;
- the organization risk exposure has changed in comparison with previous situation;
- there is a signal of risk occurrence;
- the identified risks have already occurred or risks that had not been initially identified manifest.

In practice, there are used several *instruments and techniques for risk monitoring and control* such us:

*a) Checking lists*

Checking lists used to identify risks can be used in risk monitoring and control. Particular attention should be drawn to risks that do not appear on risk identification standard lists.

*b) Risk audits*

The risk auditors have to examine the effectiveness of risk response plans regarding risk prevention, risk decrease or risk transfer. These audits should be conducted throughout the lifecycle of the company.

*c) Periodical reviews of the organization's risks*

Periodical reviews of the organization's risks have to be carried out, whereas the priority of risks may change over time and that requires additional qualitative and quantitative analysis for risks in question.

*d) Analysis of results*

To monitor the general performances of the organization we shall compare the obtained results with those originally set out and there can be found some deflections. In this case are followed again the stages of risk identification, evaluation and response.

*e) Additional risk response planning*

When unidentified risk occurs or when the impact of a risk is bigger than expected then it is possible that the planned response was not adequate. In this case it is necessary to plan a further response to risk, identifying new techniques and strategies to prevent risks, to mitigate their impact or transfer them to a third party (Bârsan-Pipu&Popescu, 2003).

## 3. RISK PREVENTION STRATEGIES

Some research studies has shown that Romanians like the Latin and Balkan nations manifests a high level of uncertainty avoidance and they permanently try to influence and control the future (Nicolau&Foriş, 2012). Fast changes affect the global economy generating additional risks that companies confront with, managers finding themselves in a position to discover new formulas to maintain a balance between exercising their authority and controlling new forms of risks.

Simple reaction to this variation of company's specific risks is not sufficient for an effective risk management. Such a relatively passive attitude of taking into account the risks and their potential impact upon the organization have to be accompanied by a strategy to anticipate and prevent risks, through the implementation of such effective processes that help the company to identify, measure and finally control risks in a pro-active manner (Horobeţ, 2005).

To protect organizations against risks, managers may apply several measures that depend on the nature of risk (we shall approach the main risk categories):

**Table 2 Risk prevention measures**

| Nature of Risk | Preventive Measures |
|---|---|
| Economic risk | - contracting insurance policies;<br>- inclusion in contracts of appropriate clauses such as those that would cover the risk that the partner will not respect the engagements specified by contract;<br>- establishment of accounting provisions (reserves);<br>- carrying out investigations on the insolvency of potential customers before signing contracts. |
| The risk of bankruptcy | - establishment of a financial reserve known as the working capital;<br>- reduce receivables;<br>- replace the inefficient managers;<br>- establishing a strong centralized financial control;<br>- establishing new payment terms and restructuring debts through agreements with creditors (e.g.: banks, suppliers). |
| The price risk | -inclusion in contracts of protective clauses such as: clause of price indexing, clause of price revisal, etc;<br>- applying to futures contracts (practicing hedging operations), contracts with options (Call and Put). |
| Operational risk | - implementing a quality management system;<br>- readjustment of the production process so that products can be quickly adapted to the new requirements of customers;<br>- building a favorable environment for the development of inventions and innovations. |
| Selling risk | - inclusion of penal clauses in the contract;<br>- require dubitable customers to present a letter of credit; when it comes about credit sales, organizations may apply to artificial neural networks that have been proved to be accurate tools for credit scoring and risk analysis (Khashman, 2011);<br>- require the auction participants to consign on the auction organizer's account an amount of money as guarantee that will be lost if they give up the conclusion of the contract. |

Along its development, the company will establish multiple risk prevention strategies integrated into a global competitive one that will make possible the significant reduction of risks that are inherent to any company, in any field of activity. Choosing a particular strategy will primarily aim to preserve organization's competitive advantage, ensuring the viability of its internal and international affairs.

According to some authors (O'Brien, 2006), to make the optimal decision about risk management in the real practice, the organization must compare the deadweight costs of not managing risk with those associated with each risk management approach. The organization will adopt a strategy that will maximize the added value taking into account

that correlations between different types of risks which is essential in measuring company`s wide risk (Nocco&Stulz, 2006).

In order to prevent risks that may occure in their performed activites, organizations may also apply Kaizen Synergy Risk Programmes (KSRP) based on Kaizen strategy concept established by Masaaki Imai, the founder of Kaizen Institute, a global organization that operates in Europe, Asia, America, Africa and Australia (Mândru&Păuna, 2012). Implementing KSRP, organizations may have a better control upon risks, improving workplace safety and business performance as a result of (KaizenSynergy, 2016):

- more efficient reporting systems;
- identification of potential risks;
- appropriate management of potential risks;
- providing adequate information to managers and board members and
- reviewing processes to minimise the occurence of identified risks in the future.

With regard to help organizations to efficiently face risks, there is also a major need of understanding risks in a systemic way, at national level looking forward to forecast their major implications upon organizations activities (Dăianu, 2009, Suciu, 2012).

## 4. CONCLUSIONS

Implementing risk management in an organization is a challenge and it presumes that employees at all levels must clearly understand the role of this kind of management and its skill to create value. Through risk management, an organization is able to understand measure and manage its overall risk in order to maximize the organization's value to its stakeholders. When it comes about increasing the value amount of the capital, then if capital is the constraint it means that for a given level of capital there is an optimal level of risk that managers may assume.

To sum up, we say that in this paper we analyzed how an organization can control the range of risks that it may be exposed to. We examined how the process of risk management can be implemented within organizations, providing the structure of investigating risks in detail. Furthermore, we had build up an overview of the risk management process which can be adopted by any organization. We want to highlight that risks should not be approached individually, separating one from eachother: managers should have a holistic view of risks. Therefore, we may say that companies can manage risks in two different ways: they can manage one risk at a time, individually or they can holistically manage all the risks that may occur in their activities applying the risk management process at the enterprise level. Companies that follow the holistic approach will benefit of a long-term competitive advantage that will lead them to business success.

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