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ENTERPRISE FLIGHT ENVELOPE: CONCEPTUAL DYNAMIC FRAMEWORK FOR CRISIS MANAGEMENT

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Abstract:
We propose a new tool for strategic planning and management, which significantly extends clarity and expressiveness of traditionally used analytic and visualization techniques. Innovativeness of our solution insists in the projection of dynamic responses of a particular enterprise management flight simulator - i.e. the knowledge-based representation of a firm structure and behaviour - to the surrounding environment. The duality with the aircraft dynamics is straightforward – every plane is designed to manoeuvre safely inside a hyperspace, claimed by intersection of allowable control parameters. Company, similarly, can generate desired value for stakeholders only under certain combinations of external and internal circumstances. Although the benefits of managerial simulations are widely known, the idea of their extension with accompanying, dynamically changing security breakpoints is new. Beyond the regular management, our solution is extraordinarily convenient for complex cases, resulting possibly to process redesign or reengineering - such as crisis prediction and management. In these situations the state trajectory of managed system crosses envelope boundary and from that moment ineffective regular parametric control must be supplemented or replaced with appropriate structural changes.

Keywords: crisis management, performance measure, flight management simulators, redesign, reengineering.

1. INTRODUCTION

Over the last years, the strategic management, its strategic tools, has become a key concept of an enterprise environment. Crisis management has understood as a measure of crisis solutions yet. Contemporary a new approach consider this discipline as a strategic tool that focus on the crisis prevention. Preventive procedures for crisis management should be a part of set strategies and should be correspond with the mode at the organization. For instance, if the organization seeks too offensive strategy, the preventive measures will have to be more particularized. Correctly the setting of strategies enables to work with the uncertainty, which is the source of the crisis in the organization. There are many sources of crisis, e.g. organizational, technological or crisis originating from an external environment. The organization steady condition during the crisis occurrences is disrupted and a general performance has negative outputs. There are the factors which are high-risk for the organizational operations. It also depends on organization how will accept and operate with these risks factors (Zuzak, 2009). The reason of the crises emergence lies in ignoring the warning signals. Signal detection and the awareness of the potential problem are considered as the important components of crisis management (Mitroff, 2001).

Crisis management acts on as a protective or prevention tool against the structural crises. To avert the undesirable conditions or crises at the organization the crisis management can uses the approaches of redesign and reengineering. Redesign of the enterprises processes have a character an improvement and the whole organization system is returned on the required state. Redesign´s implementation alters the processes of corporate system, but there are not so radical. The purpose of these changes consists in directing of processes and an avoiding a major disruption of enterprise optimum and performance.

If the organization occur in a highly unstable operation area or the crisis threats the organization´s structure it will be necessary to implement the reengineering. Reengineering (Hammer & Champy, 2002) means a fundamental rethinking and a radical reconstruction of enterprise processes. These changes should be lead to an accomplishment of dramatic improvement in terms of costs, qualities, faster processes and better services. Reengineering is characterized by a reinvention of enterprises processes and thus the whole strategy. Reengineering doesn't respect old structure and processes but build up so-called "New Beginning".

1.1. Strategic performance measurement

To the effective crisis management and it's a reaction to the possible occurrence of warning signals must be a manager's attention aim to the strategic performance. Continuous improvement of strategic performance is mandatory prerequisite for any responsible company nowadays. Although strategic managers use the term "organizational performance" frequently, they are not always aware enough of its right meaning, structure or determination. This is namely because the performance is usually established as a result of adoption of a generic managerial platform, framework or a set of related recommendations and checklists. When such "towards performance" methodology is implemented, its cumulative indicators are reported to managers and visualized through management dashboards (Yigitbasioglu & Velcu, 2011). In our opinion, not all users of this kind of administratively engrafted platform are really aware of origins, interrelations and causalities behind variables they are daily working with.

Such incomplete or partially blurred big picture can naturally lead to confusions and disappointments, frequently followed by weakly justified strategic decisions. Actually managers, lacking the holistic view, prefer limited, simple decisions, leading only to local improvements. Such narrow-sighted actions might be conditionally applicable in steady conditions, when even non-optimal decision cannot spoil the course of a company with large inertia. When weak global knowledge is combined with information insufficiency and escalated by a turbulent external environment or internal problems, managers with imperfect view can eventually originate irreversible processes, leading to crises, i.e. producing negative performance.

On the other hand, the absence of a straightforward and easy to understand model of "organizational performance for everyone" is natural, because the behavior of particular company is tightly connected with its internal processes, capabilities, structure of competitive advantage, shared values and strategies. As the majority of listed areas are subjects of business secret, we claim that particular performance metrics must be identified individually, in the wide organizational context and its final institutionalization must thoroughly validated and gradually maintained.

According to this understanding, company performance is a function of numerous high-level tangible and intangible factors. Structure of the first group is evident – it includes indicators derived, e.g., from financial items in balance sheet (assets, liabilities, equity), amount and structure of customers, supply chain descriptors or quantitative characteristics of employees. The role of intangible factors, such as, e.g., innovation, knowledge, trust, networking or organizational learning or a large group of public utility factors, is crucial for company development and competitiveness.

Although the full size of group of company's stakeholders is large and its structure heterogeneous, in the next text we restrict it, for simplicity, only on shareholders, employees and customers. This distribution fits also to the public sector, where the performance represents a complex function of costs, revenues, taxes, utility, availability, equity or quality. Shareholders are the members of government, employees are public servants and customers are citizens. In commercial sector, performance is sometimes still understood only as a function of purely tangible, i.e. financial attributes. To complete our terminological survey in this area, here we distinguish between the costs of capital, i.e. value for shareholders which can be obtained by an economic profit; an economic value added eventually a free cash flow (Starovic, Cooper & Davis, 2004).

Let's return back to our original idea, that the organizational performance or any kind of its value must be logically and transparently derived from all the available lower-level metrics, starting usually with the key performance indicators of company processes. There are several generic schemes, supporting this holistic, systemic fusion of these variables and resulting to the considerable dimensionality reduction, accompanied by a higher level of abstraction. Among the most popular and practically applicable ones we count the following ones:

- performance prism,
- strategy map,
- Balanced Scorecard.

Performance prism is an innovative approach for measuring stakeholder value. This method is considered to a new generation of performance measurement. A performance prism concerns with all stakeholders of the company which pursues theirs requirements and

interests, but on the other requires some contribution from stakeholders. The purpose of this method is examination of this relationship characterized with the strategies, processes and capacity. The capacity has a significant role because specifies the sources to enhancing the overall operation processes and the critical sets of requirements of both parties (CIMA).

To visualize an organization´s strategy can be used the strategy map. Strategic mapping (Saghaei & Ghasemi, 2009) is an appropriate tool for the analyzing and testing the causal relationship among the set of objectives and its measures. Strategy maps are a part one of the commonly used methods for measuring performance a describing the processes of value creation, the Balanced Scorecard. This method we will chose for the experiments in the next section of this article.

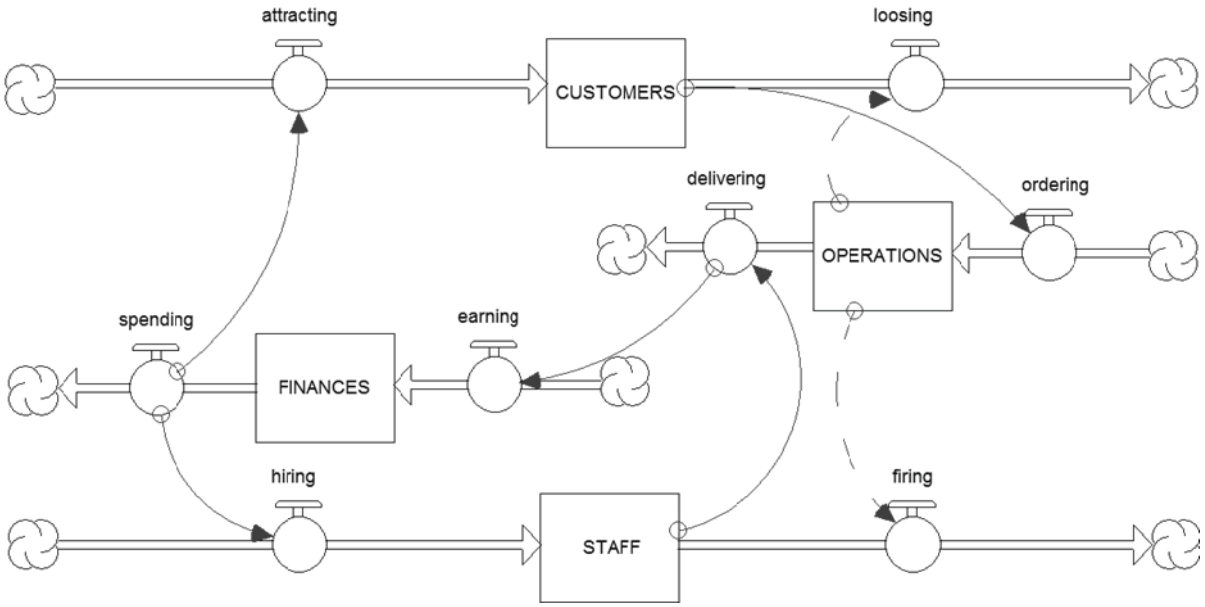
The last selected generic scheme and performance measurement system is Balanced Scorecard. This strategic approach (Kaplan & Norton, 1992) enables to view the vision and strategy in several perspectives. These areas include the customer perspective, innovation and learning perspective, financial perspective and internal perspective (internal processes). These perspectives express the key performance indicators. Key performance indicators are characterized as an essential element of the system for the performance measurement. Along these measures balanced scorecard show how well is the organization improving and creating values.

1.2. System dynamic approach

When the exact structure of institutional value is properly standardized and represented, we need to find a convenient planning tool, capable to analyze its temporal evolution, parametric sensitivity and robustness with respect to the external changes. System dynamics (Sterman, 2001) is an approach enables to study the complex and changeable system. System dynamics is grounded on feedback control system which with the stock-flow structure and time delay creates the common elements of this method. Feedback process is important for understand and evaluating the consequences of manager´s decision-making. Base on the results of feedback managers can more efficiently react to unexpected events. Time delays characterize the gap between the taking decision-making and its effects on the system. Stock and flow diagram accumulate the resources of the organization. To an establishing the stock-flow structure uses the system dynamics the causal loop diagram (Cavana & Maani, 2000). Causal loop diagram ensure the identification key variables and its relationships, analyses the organization behavior over time and develop a possible intervention strategies. Following picture 1 represent a simple example of dynamic behavior a method balanced scorecard that will be used in the part experiments. There are depicted the stock-flow structure of building blocks of generate business model.

In the dynamic environment we can find the similarity with an aircraft space. In the aviation, in order to learning about the aircraft and its behavior, were developed the flight simulators. The flight simulators allow the pilots operate in a safety environment and the warning signals on dashboards prevent them from the accidents. Principle of flight simulators was transferred into the enterprise area too. First, the term flight management simulators have been defined by John Sterman (MIT Sloan Faculty). Flight management simulators (Sterman, 2001) enable to understand dynamic complexity of whole system and give the managers an opportunity to learn about theirs decision making and obtain the feedback from its. Currently the flight management simulators together with the management dashboards are used for many purposes and its place are found in the strategic management too.

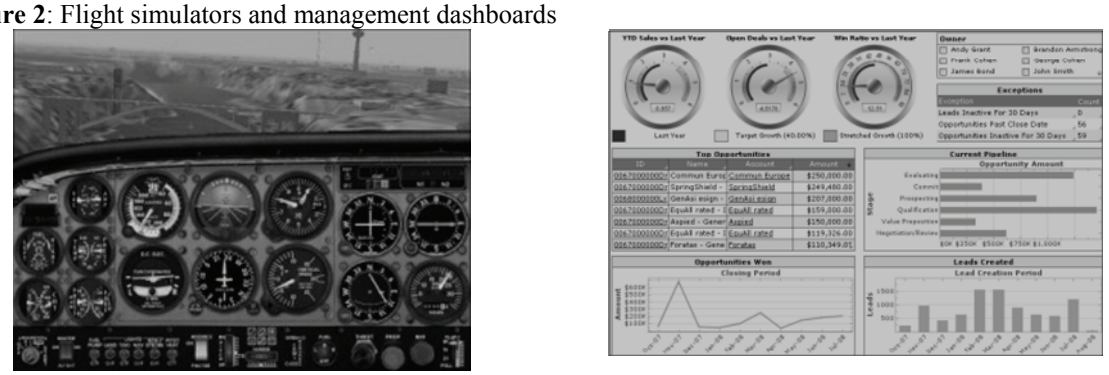
Picture 1: Schematic diagram of BSC implementation with system dynamics notation



1.3. Flight envelope and managerial flight envelope

In this article we will occupy with the principle of protection mechanism use in the aviation too – the flight envelope. The fundamental reason for using the principle flight envelope, in this paper, is a possibility timely identification the warning crisis signals and determination the boundaries of selected key parameters in the method balanced scorecard. Flight envelopes (Walgemoed, 1995, chapter 12) are using in the aviation for safety function and its expresses by the flight conditions and aircraft loading. The principle of these envelopes is based on the limiting conditions determined in a matrix expressing inter-related flight envelopes. Measured quantities represented by envelopes should be located within established borders. In aviation these quantities are represented for instance by of airspeed versus altitude, angle of sideslip versus angle of attack.

Picture 2: Flight simulators and management dashboards



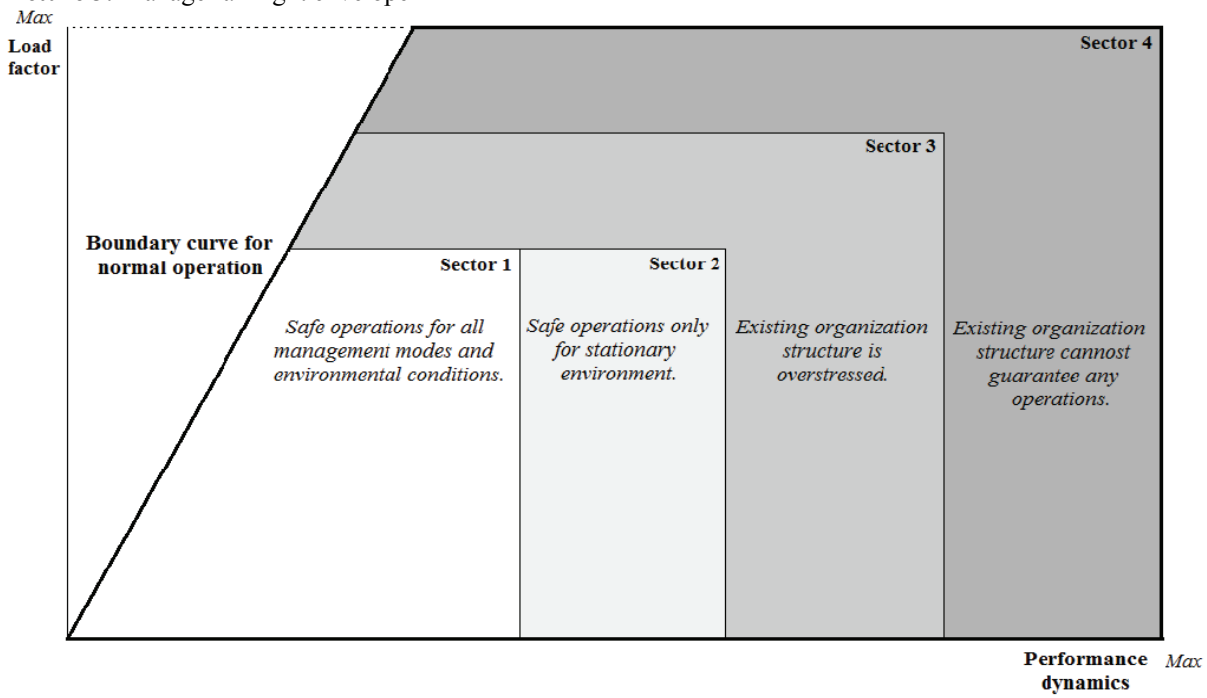
a) b)

Source a: Online Flight Simulator. (2011). Retrieved from www.onlineflightsimulators.net.
Source b: InetSoft Technology Corp. (2012). Retrieved from www.inetsoft.com/business/executive_management_dashboard/.

The following picture 2 shows transferred principle flight envelope to an enterprise system. The axis in the scheme display the indicators which determinate condition at enterprise

dynamic system. The axis performance dynamic characterize the dynamics of an environment and determine the maximum potential perform of certain level of load factor. Load factor is characterized with a capacity of organization´s capabilities, e.g. knowledge, leadership, governance, work capacity and others. Envelopes borderlines are putted the boundary curve which is determined the limits for normal operations at organization. This curve delimits the four sectors inside the managerial flight envelope.

Picture 3: Managerial flight envelope



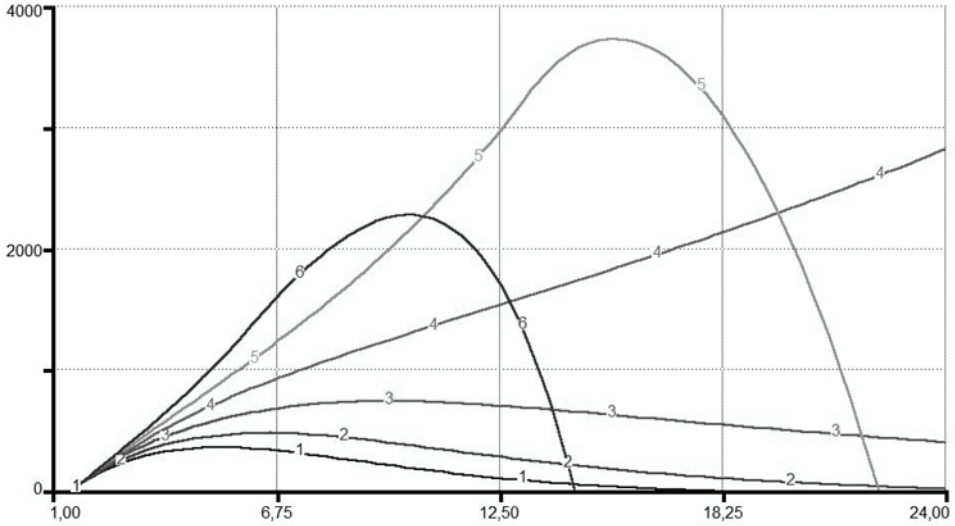
If the performance parameters deflect beyond the boundaries of the managerial flight envelope, the redesign or the reengineering will be applied. Redesign of the enterprises operation has an improvement character and the whole organization system is returned on the required state. It means, in this case, shift into better sector of the managerial flight envelope. A change of the operation at organization does not radical. Reengineering is applied in order to total restructuring of the existing enterprise system. If the operation exceeds the boundary curve it is essential to apply the reengineering.

2. EXPERIMENTS AND DISCUSION

To the experiment, we will opt for the balanced scorecard method with its parameters and for this purpose we used a software iThink. We demonstrate the protection function of the managerial flight envelope on the presentation the capacity of organization – a net profit measured in time period.

Picture 4 display the net profit per planning period of 24 days as a function of changing the capacity. It varies uniformly and relatively within its full an applicable range. For instance curve 1 represent a full release (- 100 %) and a consequent formation of crises; curve 4 depict the optimum course and no radical releasing of the capacity; curve 6 shows the full capacity building.

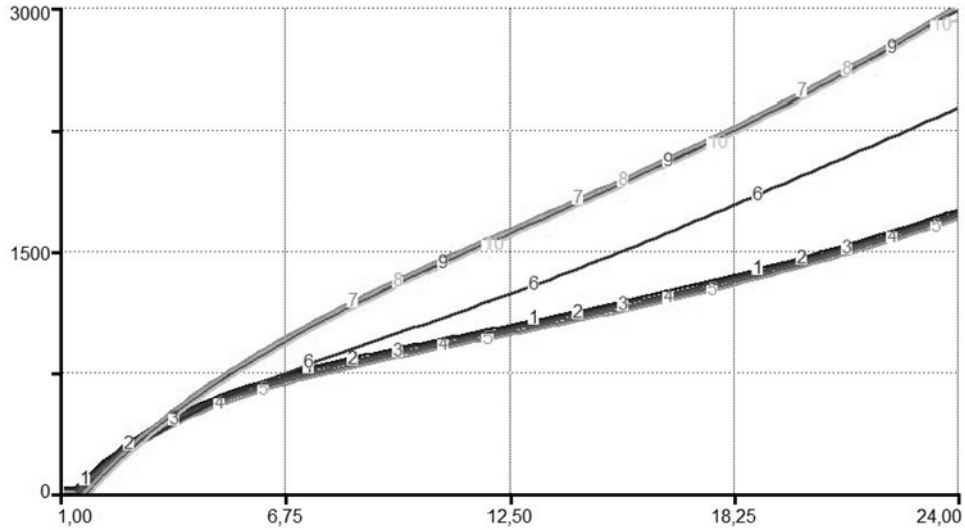
Picture 4: Capacity originated crisis



Picture 5 represents the net profit per planning of 24 days as a function of changing both marketing and quality investments. Bundle of curves 1–5 represents marketing costs varying from 0 % to 100 % of allowable budget and no quality financing. Curves 6–10 show the varying marketing costs again, but now with 100 % quality funding.

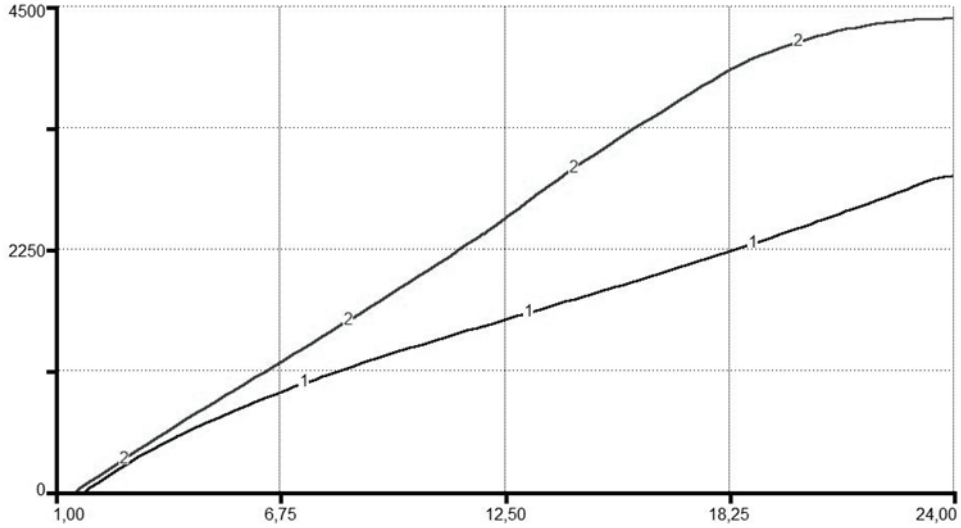
Parameters of the utmost curves claim the maximal range of corresponding flight envelope parameters. In other words – system with this type of management behaves safely only in the intra curves area.

Picture 5: Analysis of quality and marketing investments for a safe level of capacity



Picture 6 display the optimal net profit per planning period of 24 days, i.e. one-shot envelope driven management (curve 1) and its dynamics implementation with control step 6 days (curve 2). Area between the both curves illustrates advantage of model and managerial flight envelope driven dynamic environment.

Picture 6: Dynamic implementation of managerial flight envelope



3. CONCLUSION

We introduced a new concept of safe performance envelope, convenient particularly for strategic and crisis management. It introduces dynamic safety limits into traditional managerial simulators, which narrows the set of applicable control actions and pushes company away from smoldering crises. We ported such safe control mechanism to the well-known balanced scorecard principle and also illustrated advantages of its dynamic, i.e. time-windowed application.

Our future research is oriented towards the formal investigation of envelope principles, especially its proper enumeration in cases of multidimensional interaction of performance parameters.

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