

# Implementing “sustainability-by-design” approach in organizations by using an extended risk indicators system for making strategic decisions

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## ABSTRACT

The purpose of this article is to identify possible approaches to the development of the “sustainability-by-design” process, which consists in synchronizing the organization's strategy with the trends of sustainable development. For this purpose, a process of “sustainability-by-design” is proposed on the basis of the “safety-by-design” process applied in practice. As a key link in the process, it is proposed to use a system of sustainability indicators, supplemented by indicators of risk and resilience. To strengthen the adaptive capacity of companies in the field of sustainable development, the process of building “sustainability-by-design” is complemented by the inclusion of democratic procedures through structured stakeholder participation. As a result, the proposed process combines a rigid structure of values and goals with a “soft setup” in the form of democratic procedures. This will allow companies not only to reduce the uncertainties inherent to the pacing problem, but also to create an environment for the promotion of the most effective alternatives to the development of companies in the field of sustainability.

## KEYWORDS:

sustainable development, risk management, resilience.

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## 1. INTRODUCTION

Effect of sustainable development trends on business operations is getting more significant with the lapse of time. In the meantime there exists a high degree of uncertainty concerning the list of potential demands in future as well as related consequents. Under such conditions a process of strategic planning concerning sustainability reminds of a quick fire and drawing on the current requirements for sustainable development accounts may lead to making false and even fatal strategic decisions. How should business guarantee conformation with changing requirements and create a clear position towards sustainable development?

For solution of the problem this article gives analysis of various approaches and suggests solutions towards corporate strategies adapting to sustainable development trends.

The first section of the article presents an analysis of the current situation concerning requirements and trends in the field of sustainable development. Existence of a slow regulation problem which appears during the quick technological development periods [Downes, 2009; Marchant et al., 2011] is highlighted here as well as the features of business operation model change. The second section shows approaches towards solving the problem of the slow regulation in the spheres of action connected with safety and security. [Yatsalo et al., 2005; Strategic environmental assessment, 2018; Trump et al., 2020] It is shown that the process of “safety-by-design” formation can be taken as a basis during “built-in sustainability” formation as long as the revealed restrictions are eliminated. The third section describes the available proxies in the context of sustainability [Hardi, Zdan, 1997; Wu, Wu, 2012] and justifies practicability of addition of red flags

and viability indicators to sustainability indicators system. [Sikula et al., 2015; Faber, 2018; Gillespie-Marthaler et al., 2019]. The forth section is devoted to modification of the “safety-by-design” formation process for the purposes of sustainability. In the capacity of a key component of the process an extended system of sustainability, risk and viability indicators is suggested to be used. Moreover, for closing the gaps involved in a technocratic indicators system [Reid, Rout, 2020] democratic procedures are included into the process. A variant of using of the extended indicators system simultaneously in both directions was suggested: for exclusion of inefficient alternatives as well as for alternatives formation in the sphere of sustainability.

## 2. BUSINESS RISKS CONNECTED WITH SUSTAINABILITY MODEL CHANGES

Sustainable development problems are becoming of greater importance in company activity over the last years. Adjustment for economic growth has led to a number of serious issues requiring quite a prompt response of the whole world community. In particular, environmental and social problems, climate change appear critically. International community responded with adoption of a few basic documents in 2015: Paris agreement within the context of United Nations Framework Convention on Climate Change<sup>1</sup>, Sendai Framework for Disaster Risk Reduction 2015-2030 years<sup>2</sup>, United Nations Programme on Sustainable Development Goals (SDGs) – from overcoming of destitution and famine elimination to gender equity providing and taking prompt

<sup>1</sup> UNFCCC Paris Agreement. December 12, 2015.

<sup>2</sup> Sendai Framework for Disaster Risk Reduction 2015-2030. UNISDR, 2015.

actions to crack down climate change.

Business as the most essential part of the world vital activity is being also actively involved into the processes concerning assurance of stability. At the moment this kind of activity is supposedly not regulated directly and not coordinated. For the most of the enterprises sustainable development means a number of projects aimed at compliance and reputational goals. One of the crucial directions of this kind of activity is preparation of the corresponding accounts and getting of ratings. Accordingly, there is quite a high degree of freedom in the context of the activity on sustainable development itself as well as accounts preparation. For instance, the most frequently practically applied Sustainability Reporting Guidelines Global Reporting Initiative (GRI G4)<sup>3</sup> doesn't contain clearly made requirements towards composition of the disclosed information, there is only a standard list of recommended aspects and markers for their disclosing. Technique of the importance evaluation of the subjects determined for the enterprise with the purpose of inclusion into account is actually optional and allows to show the most profitable areas of activity.

At the discretion of a company an issue concerning disclosing volume of all stages of life cycle of products or services output is also left. As a result life cycle estimates are quite thinly represented in most accounts [Stewart et al., 2018]. Different level of information disclosure is revealed in the accounts and in supply chains: from brief description of purchasing and main suppliers to quite a full picture of implementation of sustainable development practices in supply chain.

Interest towards sustainable development problematics in business world picks up from the perspective of pecuniary institutions and investors as well as of business partners. For the more system view of the data about the level of sustainability and company long term benefits ESG-ratings are widely applied (E - environmental, S - social and G – governance). During rank calculations specifically considered metrics are applied which are based on principles of comparability, effect, data accessibility and industrial significance for each trade group. It is assumed that ESG-ranks represent more adequate information source in comparison with company accounts on sustainable development. Indeed, ranks calculations are made according to identical pattern for all companies and can be taken as basis for comparable valuation. Nevertheless, there exists a great result dependence on valuation technique as well as on availability of data concerning a certain region. Among Russian ESG-ranks RAEX-Europe<sup>4</sup> can be mentioned as well as RUIE (Russian Union of Industrialists and Entrepreneurs) indexes concerning sustainable development<sup>5</sup>.

Recently investors have become more interested in impact investing. Generally, it is in tune with stable investing but is to a greater extent aimed at revealing of potential top companies when it comes to global problems solving.

Particularly impact investing is closer to the essence of

the current business model change. Globally sustainability is no longer a subject of compliance and intangible benefit source. Now sustainability becomes a direct source of profit growth and strengthening of competitive positions. Meanwhile requirements towards sustainability are no longer external concerning the companies, but become a natural and integral internal necessity of business. And it is not only about quantitative changes: environmental investments market volume will by some estimates<sup>6</sup> amount to 23 trillion US dollars by 2030.

It's quite obvious that although the current transformation of the whole world structure possesses quite definite goals and prospective ways of achieving the goals, it is connected with anomalously high uncertainty and dynamics. Strategies based on extrapolation and background experience analysis become abruptly insufficient. Companies need means of adapting to unexpected changes to be able to save their strategical sustainability.

### 3. «SAFETY-BY-DESIGN» AS A BASIS OF «BUILT IN SUSTAINABILITY» FORMATION

Before proceeding to description of the main approaches towards “built in sustainability” formation, let us specify terminology. Definition “built in sustainability” of companies, used in the present article context, is not identical to a notion of strategical sustainability [Camocyдов, 2006; Григорьева, 2013] which is in general perceived as “organization components interaction, which allows to provide a positive dynamics of performance indexes for efficiency improvement of running of organization during a long period of time” [Кузнецова, 2020]. “Built in sustainability” for the purposes of the present article is a feature obtained by companies as a result of the process of adaptive synchronization with fundamental world trends, connected with sustainable development.

Proceeding to a new model of strategic decisions making in terms of changes in the sphere of sustainable development is needed in view of aggravation of a so called pacing problem (time lag) [Downes, 2009; Marchant et al., 2011]. The pacing problem is about the fact that technological development pace is much higher over the last years in comparison with the regulating authority capability to provide adequate frames for the current changes. That's why companies face the situation of the seeming autonomy and non-systemicity in the sphere of sustainable development regulation, which is described in the previous section. If turning to graphical interpretation the present-day situation looks like regulation pacing problem (pic. 1).

Meanwhile a company being at the point A during the T1 time point, rests on regulatory documents in the volume of B when making strategic decisions. This AB regulatory gap

<sup>3</sup> URL: <https://www.globalreporting.org/>.

<sup>4</sup> URL: [https://raexpert.eu/esg\\_corporate\\_ranking/](https://raexpert.eu/esg_corporate_ranking/).

<sup>5</sup> URL: <https://media.rsp.ru/document/1/8/b/8bc5ac4b5914eddd2eb4f34ee695d550.pdf>.

<sup>6</sup> URL: [https://www.ifc.org/wps/wcm/connect/news\\_ext\\_content/ifc\\_external\\_corporate\\_site/news+and+events/news/new+ifc+report+points+to+%2423+trillion+of+climate-smart+in+vestment+opportunities+in+emerging+markets+by+2030](https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/new+ifc+report+points+to+%2423+trillion+of+climate-smart+in+vestment+opportunities+in+emerging+markets+by+2030).

can create an illusion of relative autonomy and lead to making inefficient decisions.

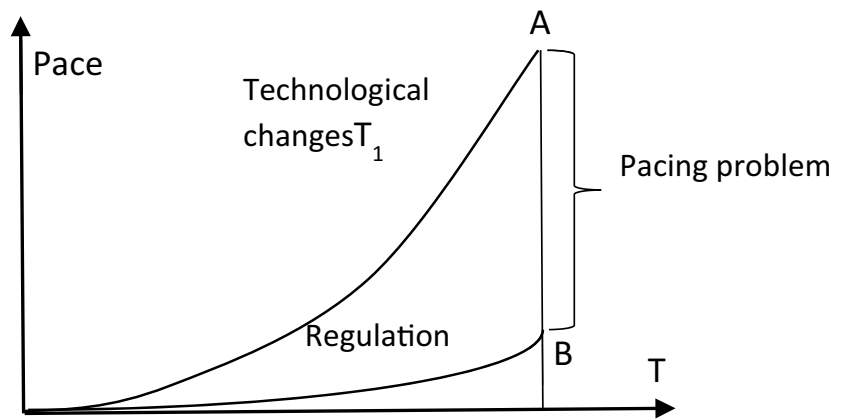
For the purpose of uncertainty degree reduction some of the foreign regulatory authorities<sup>7</sup> in the sphere of nanotechnologies recommended applying of a “safety-by-design” method while examining strategic alternatives. The creators of the work [Trump et al., 2020] suggest a multi-criterion decision-making analysis (MCDA), thereat in the capacity of additional support they offer to use risk assessment materials, collected for the time being (pic. 2), uncertainty reduction while decision making concerning delayed regulation. This allows to essentially reduce uncertainty to the distance BC and to quicker lean towards adequate regulation.

At the same time it's profitable for companies to rest on the same risk assessment data. Thereat, apart from the more precise regulatory requirements forecast, they will win time advantage and information gain for strategic decisions taking.

The first stage of “safety-by-design”, shown on the pic.3 (“safety-by-design” process scheme), suggests analysis of technological development alternatives, business model, interested parties (stakeholders) and their interests, and also possible alternatives in the sphere of sustainable development. The second stage is about comparative evaluation of the most preferable alternatives, revealed at the first stage, together with current risks data statistics. At the third stage top priority alternatives are examined through the lens of the current regulation. Analysis at this stage should presuppose selecting the alternatives, realization of which is connected with the highest advantages, the least risks and the least expenditures for compliance.

The presented scheme is not the only right variant but can change depending on a task context. For instance, in environmental risks management tasks [Yatsalo et al., 2005] the possible approaches towards alternatives analysis are presented on the basis of DECERNS (Decision Evaluation in Complex Risk Network Systems) methodology. One of the examples of the most measured comprehensive approaches towards the process organization as well as towards selecting of the fundamental methods and criteria is described in IAEA recommendations “Strategic environmental assessment atomic energy programs: controlling principles”, where goals, obligatory process components are examined in detail as well as variety of possible methods and criteria of analysis, their advantages and disadvantages [Strategic environmental assessment., 2018]. Such a serious approach is quite reasonable for capital intensive objects of

Pic. 1. Regulation pacing problem



Source: [Marchant, 2011].

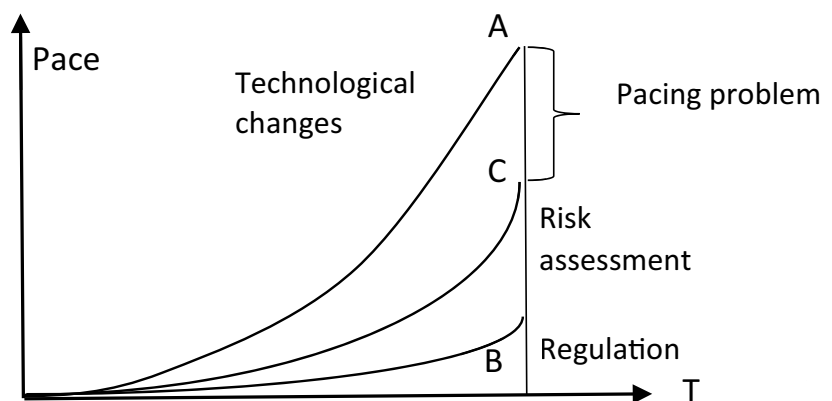
atomic power energetics.

For the organizations which basically rest not on planning quality in their strategy but on a high adaptability, viability evaluation model MIRA will be more applicable. It is developed for military installations [Sikula et al., 2015]. To proceed to adaptive model from command and control model methodology SPARK was developed [Dos Santos, Partidário, 2011], that is short for methodology of strategic planning for viability support.

Along with conclusion about a vivid benefit from using “safety-by-design” processes for solving pacing problem two key points should be highlighted, which require improvements to be used for “built in sustainability” goals:

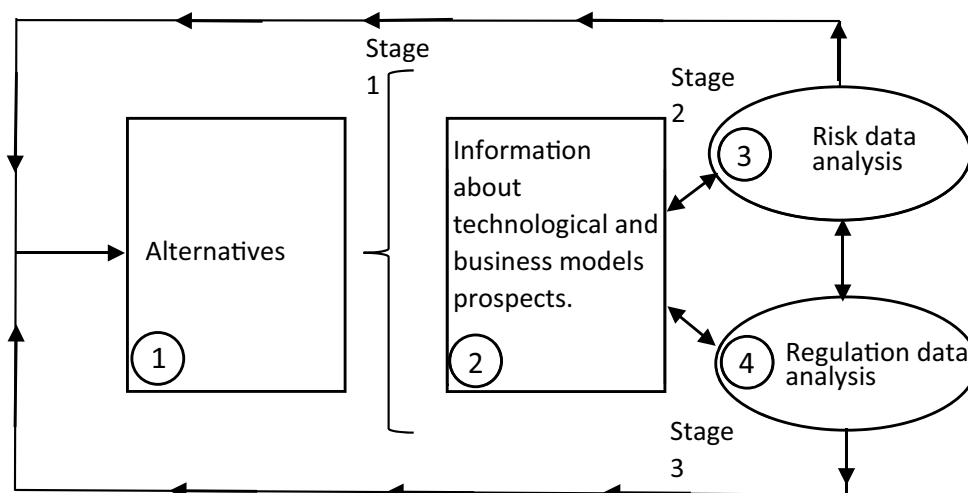
- firstly, direct change of risk indicators for sustainability indicators in box 3 on pic. 3, which are presented by regulation forecast in the sphere of sustainability, is obviously insufficient considering high degree of sustainability development trends uncertainty;
- secondly, the “safety-by-design” process is only aimed at rejecting of dangerous alternatives. Accordingly, a direct transfer of the process into the sphere of sustainability will solve only regulation

Pic. 2. Uncertainty reduction while decision making concerning delayed regulation



Source: [Trump et al., 2020].

Pic. 3. "Safety-by-design" process scheme



Источник: [Trump et al., 2020].

spacing problem. However, influence of sustainability trends on a company will be considered, and the influence of the company on environment will not be taken into consideration. At once possibility of proactive company's activity planning in the sphere of sustainability is discounted.

Even IAEA model involving applying of positive technological moments, highlights its fundamental function in a summary description as a role of a "critical friend" [Strategic environmental assessment..., 2018].

Proceeding from analysis of "safety-by-design" methods advantages and disadvantages one can make a conclusion that they can be taken as a basis for application in strategic planning tasks, which refer to sustainable development. Nevertheless, it is not enough just to mechanically replace "risks" with "sustainability", but it is necessary to reject the revealed limitations, that will be a subject of the following sections.

#### 4. APPROACHES TOWARDS DEVELOPMENT AND APPLICATION OF AN AUGMENTED SYSTEM OF SUSTAINABLE DEVELOPMENT INDICATORS

The key element of decision making process is box 3 (pic.3), connected with sustainability information analysis. If designated use of a process is not just compliance, but development of a company's strategy, then it is suggested that this box should be represented not by one but three cooperative elements:

- sustainability information analysis (sustainability);
- risks analysis;
- resilience analysis (resilience).

Reasoning of such a combination is explained by the fact that to plan adaptive system it's not enough to only possess information about prospects in the sphere of sustainability, where uncertainty and changes dynamics are very high. To improve decisions reliability a sustainability prospects and analytical box should be supplemented by risks analysis box. But on account of the fact that classic risk management is quite effective only when small contraventions of risk factors from previously observed values take place, it is necessary to deploy a resilience component, which is responsible for analysis of readiness to properly respond to unlikely and sometimes unpredictable events.

In such a combination these three areas of knowledge: risk management, sustainability and resilience have been used in scientific literature not long ago. Nevertheless, research [Nielsen, Faber, 2019] registers a considerable increase of publications and interest in each of the topics as well as in their collective use.

Validation can be found in the very definition of sustainability as it is given in [Wu, Wu, 2012]: «Sustainability reflects our ability to keep an interrelated system human-nature in a desirable state during a few generations with present anthropogenic and ecological indignations and uncertainties». That is, sustainability is kept by means of two fundamental components: a directed movement to sustainability and readiness to keep sustainability during shock and crisis periods. That's why to achieve sustainability a risk management is needed, which possesses perfect opportunities for assistance in meeting of the goals. But interrelation between anthropogenic and natural systems is so complicated and unpredictable, that a usual predictive analytics of the risk management will not be able to reflect all possible variants of sequence of events. Consequently, least of all to achieve sustainability resilience is needed, which deals with preparation for responding to unforeseen events.

Traditional risk management methods increasingly frequently turn out to be not able to provide companies



with an adequate response to unfavorable events [Sachenko, 2020]. For closing the gap all the above given concepts of sustainable development must be supplemented by resilience analysis. In a scientific literature and practical activity topicality of this direction has recently essentially increased, and resilience is increasingly frequently specifically considered as a complimentary activity in relation to risk management. [Linkov, Trump, 2019; Sachenko, 2020]. Just as in other dynamically developing research areas, there are various approaches towards understanding and assessment of resilience. Definition of resilience integrating all these approaches, is used in United Nations International strategy for Disaster Risk Reduction8: “Capacity of a system, community or society which undergo hazardous exposure, for opposition, absorption, adaptation and reconstruction after the exposure, as well as for timely and effective eliminating of one or another danger consequents, including by means of keeping and reconstruction of its essential features, main structures and functions”. That is, resilience provides the second sustainability component – corporate management under the influence of negative effects, caused by natural or anthropogenic factors.

For practical application of the described approach about simultaneous analysis of sustainability, risks and resilience, it is needed to develop an integrated system of indicators, uniting the three sections of the analysis in terms of a particular company’s goals and nature of activity. Unfortunately, there is no cross functional set of indicators for such a complicated task. That’s why adaptation of the existing methodical offers for the particular tasks is needed.

Many researches have been recently made concerning development of risk, sustainability and resilience indicators. Omitting a well-known by practitioners risk indicators subject, let us make a brief review of the indicators of sustainability, resilience separately and within crossing variants.

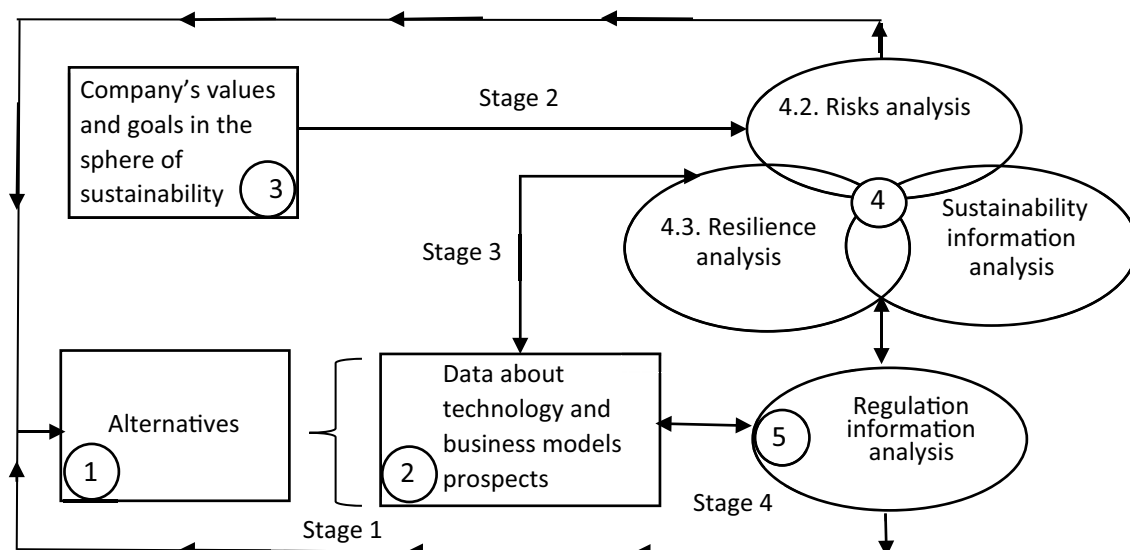
Sustainability indicators give an information about condition, dynamics and fundamental driving forces of a system “organization – environment”. Among the most frequently recommended for development sustainability criteria there are so called Bellagio principles which were offered by a group of specialists in the sphere of sustainability at the conference in Bellagio, Italy [Hardi, Zdan, 1997]. They touch the whole process of development and application of sustainability indicators – from goal setting and task scope definition to evaluation and improvements. Specific examples of sustainability indicators application are described for various branches, in particular for steelmaking [Arena, Azzone, 2010], energetic [Afgan et al., 2000], agricultural [Mohamed et al., 2014]. Nevertheless, as it is stressed in [Wu, Wu, 2012] – one of the most detailed reviews concerning sustainability indicators, depending on the chosen indicators system, their sufficiency or redundancy, it is possible to come from boundary condition task to absolutely various conclusions regarding sustainable development. The main success factor during development of an adequate sustainability indicators system is the fullest taking into consideration of the sustainable development principles with all their complication and understanding of

the frames, matching the criteria. And this consideration must be expressed in the supreme capacious form.

A great number of researches are made concerning companies’ resilience indicators, in particular [Bruneau et al., 2003; Lengnick-Hall et al., 2011; Rose, Krausmann, 2013]. The authors of the work [Linkov et al., 2019] emphasize four comprehensive components of any complex system: physical, informational, cognitive, social. As a result of their integration with resilience process the authors received a so called resilience matrix which considers the quality of every emphasized vital system component at the main stages of resilience assuring: preparation, shock absorption, reconstruction and adaptation. In the work [Ganin et al., 2016] an approach of a quantitative assessment of a system resilience is described on the basis of the notion of the critical functionality, which is a minimum requirement set of functions during the crisis period. One of the most methodically finished works on implementation of early messengers system allowing to anticipate serious situations and to improve organizational resilience, describes REWI method (Resilience based early warning indicators) [Qien et al., 2012]. It is based on eight resilience components assessment. These are: risk understanding, anticipation, attention, responding, robustness, resources capability/response time sufficiency, support of decisions and doubling (reservation).

Apart from the stand-alone systems of indicators in some fields of study a growing number of works have recently been aimed at getting joint estimate of risks and resilience or of resilience and sustainability. Accordingly, in the work (Sikula et al., 2015) a joint risk and resilience indicators system MIRA (Military installation resilience assessment model) is suggested, which is focused on analysis of interrelation and functionality and on integral evaluation of social and technical systems, and which is aimed at improvement of response and adaptation quality when it comes to unfavorable events. As the authors say, the system can’t be all the time resistant to everything, consequently, the key element of the analysis is defining of critical functionality, which must be supported. In the work [Gillespie-Marthaler, 2019] there is a set of indicators and metrics, referring to comparatively new concept of sustainable resilience. The concept is aimed at improvement of the system resilience, proceeding from time analysis of vulnerabilities and margin of safety in terms of potential threats. It is supposed that sustainable resilience is obtained from the capability of the system to undergo the needed changes. Again, according to the previous example [Sikula et al., 2015], a basic priority in the indicators system is a system survival, then welfare indicators and the last position in order of importance is taken by indicators of readiness for responding to incidents. M. Faber suggests a decision, which is equilibrating for social and technical system: sustainability, risks and resilience. He says that until a few years ago sustainability and resilience were different knowledge areas, although, in his judgement, the time has come when these areas are united by common risk sources: collapses in natural system lead automatically to collapses in socioeconomic systems and vice versa.

Pic. 4. Scheme of the company “built in sustainability” formation process



Consequently, today there is a clearly expressed orientation towards combination of sustainability, risks and resilience indicators, which are presented by a variety of methodical developments. This kind of combination can provide making of the most knowledgeable and accordingly, the most efficient decisions regarding companies' development in the direction of sustainability.

## 5. THE PROCESS OF COMPANIES “BUILT IN SUSTAINABILITY” FORMATION

The main task during the “built in sustainability” formation is blocking of dangerous ways of technologies or systems development. For such a statement of a problem the scheme of the process, that is shown on pic.3, is one of the most suitable variants of solving.

Nevertheless, while planning strategical decisions regarding sustainable development the statement of a problem changes essentially. At the moment the environment of business operations undergoes dynamic and poorly predictive changes. First of all, it is connected with a serious transformation of the key efficiency indicators for companies. Obviously, target indicators of the companies do not conform to societal demands, that's why in the nearest time the passing from purely economical indicators to a kind of combination of economical efficiency and sustainability will unfailingly happen. The way these companies objects will balance as a result is yet to be explained.

Under such conditions it is not enough for the “built in sustainability” formation just to block variants which do not meet the requirements, it is necessary to create alternatives

which mildly “tune” business to the wave of sustainable development. Accordingly, in terms of creation, a restrictive function of the before reviewed process is inherently insufficient. It is possible to make up this deficiency and to form ideas incubator for a company sustainable development if we slightly upgrade the process scheme, given on pic.3, into the scheme, given on pic.4, that is the scheme of the company “built in sustainability” formation process.

In the present scheme the indicators box is presented by the three joint sections (4.1–4.3) of sustainability, risks and resilience. But regulation pacing problem is not the only advantage of application of the joint risk, sustainability and resilience indicators system. There is one more function of the present knowledge box which is no less important or maybe even more important. It is about possibility to use this box for generation of company's alternatives concerning the sustainable development (stage 2 on pic.4). The case is that lately practice of indicators system application has been coming under strong criticism. Accordingly, J.Reid and M. Rout [Reid, Rout, 2020] describe disadvantages of a so called technocratic approach towards sustainability indicators development. This approach is based on relocation of measuring procedures of technical systems to complex socioeconomic systems. During this relocation and as a result during the process of indicators aggregation, the essential features and interrelations of such systems disappear, that deviates a company from effective decisions making. Besides, technocratic estimates tend to quantitative expression, that not always conform to essential features of social and natural systems. To fix this disadvantage the authors suggest an alternative approach to indicators system development, which is based on a broad participation of the interested parties with a thoroughgoing transparency assuring. The key elements of such transparency are value-oriented transparency, informational transparency during

indicators development, informational transparency of risks and sustainability, transparency of goals in the sphere of sustainable development. Together with complexity and imperfection of a democratic procedure with the participation of many interested parties, this kind of approach will allow to fill the gaps, which can be made by expert group during development of the technocratic indicators system.

Apart from the prescription described in [Reid, Rout, 2020], namely a “soft setting” of indicators system, the democratic procedure gives to a company one more development opportunity in the sphere of sustainability. Obviously, the democratic approach may be used not only for correction of risks indicators system, but also for development of the alternatives (stage 2 on pic.4). This enriches company’s opportunities with different development variants, which are beyond the limited knowledge of a narrow group of people.

For instance, a company which clearly specifies its values and goals in the sphere of sustainable development, can become attractive to the most responsible employees in this regard. If understanding of the goals and specific nature of company operations is correct, creative employees can be a perfect source of alternatives, leading to competitive advantage. Consequently, supplementing application of an extended indicators system (stage 3 on pic.4) by a clear identification of objectives and by organization of the interested parties participation (stage 2 on pic.4), a company can not only improve the rigid indicators system itself but create a “nutriculture medium” for alternatives formation. This will help to maximally efficiently organize the process of adaptive synchronization with sustainable development processes, providing a company with the “built in sustainability”.

## 6. ЗАКЛЮЧЕНИЕ

The suggested by the article scheme of the “built in sustainability” formation process, strategy of the company concerning the processes, connected with the sustainable development, is based on analysis and finding balance between the two divergent effects:

- impact of the regarding to the sustainable development processes on a company;
- a company’s impact on the sustainable development processes.

It involves using of the “safety-by-design” model, which is applied for solving of the regulation pacing problem in the quickly developing spheres of activity, connected with risks for people and environment. After analyzing of the revealed disadvantages an initial model was upgraded for using for sustainability purposes.

The key component of the suggested “built in sustainability” process is using of a joint sustainability, risks and resilience indicators system. This allows to reduce the impact of uncertainty and to make maximally well-grounded decisions under conditions of the regulation pacing problem.

This very indicators system is offered to be used during the process of company’s alternatives formation in the sphere of sustainability. For this purpose, a structured democratic process with participation of the interested parties is suggested. It is based on a precise definition of company’s values and goals in the sphere of sustainable development. This kind of approach can fill the gaps of the indicators simplified model, established by a few experts as well as maximally efficiently use a creative potential of the interested parties for creation of the most effective company’s strategy in the field of sustainability.

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