

# Construction Project Management Based on the Circular Economy

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## Abstract

Difficulties in developing an adequate strategy for the implementation of projects for the development of organizations in the context of the transition to a circular economy form new strategies and ways of qualitative changes. The issue of assessing the cognitive readiness of management teams for the successful implementation of projects comes to the fore in the analysis of projects and programs in conditions of turbulence. This will be especially evident during the period of radical changes that accompany the coronavirus pandemic, the negative consequences of military aggression and the global recession. Such global external challenges significantly increase the uncertainty of others and influence the processes of strategy formation and its analysis. Thus, the main task of the study is to analyze the features of construction project management based on the circular economy. As a result of the study, the main aspects of construction project management based on the circular economy were investigated.

**Keywords:** *circular economy, administrative services, management, project management, projects.*

## 1. Introduction

Today, a well-defined strategy for the implementation of projects for the development of organizations is the determining factor for success. At the same time, the strategy integrates project management teams with the organizational mission and vision of the customer and other key stakeholders, ensures the current activities of the project development of the formation of a management approach, identifies, evaluates and analyzes the critical success factors of projects and identifies, evaluates and analyzes key performance indicators for project implementation. Strategic analysis is a check and evaluation of the quality of work of the units of an organization, project or program in which strategic management is carried out. Such an analysis can be either comprehensive, that is, affect the stages of the strategic management

process, or directed - affect only part of the processes [1].

Strategic analysis is an examination of the process of achieving the goals of organizations' development projects under conditions of uncertainty. When conducting a strategic analysis, the manager evaluates the results of the strategic analysis carried out in the organization, made a strategic choice and implementation of the strategy, as well as control over its implementation. At the same time, qualitative indicators of goal-setting and holistic achievement become dominant, especially at the levels of performance analysis and strategic analysis. This requires the development of suitable methods and approaches for the analysis.

The transition to a circular economy is a systemic change. In addition to targeted actions affecting every phase of the value chain and key sectors, it is necessary to create conditions under which the circular economy can mobilize resources. Innovation will play a key role in these systemic changes. To reimagine the way we produce and consume, and turn waste into value-added products, we will need new technologies, processes, services and business models that will shape the future of our economy and society [2].

The transition to a circular economy will also require a skilled workforce with specific and sometimes new skills, as well as opportunities for employment and social dialogue. Strategic analysis of projects reveals the degree of connection between the policy and the specifics of the project and the external conditions for its implementation. Each of the parts of the strategic analysis is based on the corresponding area of strategic accounting and strategic analysis, all this merges together in the accounting and analytical support for making

strategic decisions, which, in combination with the project development strategy, are subject to strategic analysis.

In the conditions of the economic crisis, the problem of successful implementation of projects can be solved by forming a reasonable development strategy for the organization implementing the project and carrying out activities aimed at achieving the goals of the project. In this regard, to increase the degree of validity of strategic management, strategic analysis is important, which provides for the formation of complete information about the future development of the organization under the influence of internal and external factors [3].

The general vector of development of strategic analysis since its inception has so far assumed that analyzers only perform certain technical and tactical procedures aimed at confirming the reliability of reporting data used for short-term management decisions by different groups of stakeholders. In the analyzer's conclusions, there was no information necessary to achieve the long-term goals of the economic entity and stimulating the dialectics of the qualitative development of the financial and economic state of the project.

The assistance of the organization development project in the existing strategy with subsequent analysis and control over its implementation will help to quickly respond to the constantly changing influence of external and internal factors and thereby achieve the stable development of organizations operating in turbulence, bringing them to a specific practical result [4].

The circular economy is a term for the transformation of the industrial economy, which is designed to be based on renewable resources. The circular economy works from the very beginning of the life of the project. Both the design phase and manufacturing processes affect the sourcing, use of resources, and waste generation throughout the life of the project product. Improved design can make products last longer or easier to repair, upgrade or refurbish. This can help recyclers dismantle products to recover valuable materials and components. All in all, it can help save precious resources [5].

However, current market signals do not appear to be sufficient to make this happen, in particular because the interests of producers, users and processors are not aligned. Therefore, it is essential to encourage improvement in product design while

maintaining a single market and competition, and promoting innovation.

## 2. Methodology

For a more detailed study of the main features of construction project management based on the circular economy, the following methods were used: induction and deduction, comparison and systematization; synthesis and analysis; abstract-logical - for theoretical generalizations and conclusions of the study.

## 3. Research Results and Discussions

A modern big city is a complex system where natural and anthropogenic components are inextricably linked. Usually, the quantitative prevalence of the anthropogenic component leads to the dominance of anthropogenic impacts on the environment and, as a result, on the architecture of the city [6]. But even in this case, there is always the opposite effect of ecology: the unsatisfactory state of the environment (air pollution, etc.), caused by other types of human activity, has a negative impact on the state of construction projects.

Thus, earthworks (digging pits, tunnels, drilling, etc.), the construction of multi-storey buildings with a small building area change the natural level, and sometimes the direction of groundwater. At the same time, a change in the water level leads to blocking of foundations, corrosion of structures, further to subsidence or removal of buildings and loss of the bearing capacity of individual structures and buildings as a whole. The production of building structures significantly deforms the environment (pollutes the air, water bodies, soil, changes the natural relief) and devastates natural resources (sand mining in riverbeds, stone quarrying, etc.). On the other hand, the use of environmentally hazardous materials in construction (toxicity, carcinogenicity, radiation pollution, etc.) leads to negative parameters of the human environment both during the construction process and during the operation of the building [7].

Considering the above aspects, modern design and construction of any local facilities or large urban complexes, as well as work on the reconstruction of buildings and territories, can no longer be carried out without taking into account environmental standards.

Let us formulate a system of fundamental principles for the formation of an effective strategy for construction projects and programs in a circular economy.

Let's look at each of the principles.

1. Validity - supporting each of the provisions of the strategy with scientific analysis. An effective strategy must have conceptual certainty and respond to unpredictable and unknown factors. An indispensable condition is the prediction of dynamic correction of the criteria and target indicators of the strategy. An effective project management strategy in a transitional economy should be based on the recognition of the objective need for a period of instability in the transition to a policy of growth and the use of elements of instability as additional levers for transformation. Failure to take this objective process into account when building strategies will mean its spontaneous nature, which will be perceived as a threat to the implementation of the strategy and a call for emergency measures not provided for by it. This will mean its failure as a complex of interrelated measures for managing projects and programs [8].

2. Transparency - a clear statement of the strategy, proof of the mission and vision, directions and objectives of the project stakeholders and strict adherence to them. Truthful information about the need for management measures for applied projects and their appointment in the context of a holistic strategy, transparency of information about the possible reaction of stakeholders to the destabilization of the external situation is a necessary condition for consolidating the efforts of stakeholders. The presentation of the strategy should not be simplified. Simplicity is contrary to the transparency of the strategy, since it hides the whole range of its possible consequences.

3. Legitimacy - the perception of the strategy as overwhelming by stakeholders. During the development process, the project and program strategy should provide development drivers on which its implementation will be based, for which it should combine realism - based on a sober assessment of project opportunities - and acceptability of stakeholders through socially attractive goals. An effective strategy should be focused on the widest possible distribution of value created [9].

4. Adequacy - taking into account a set of characteristics of the current state of the project environment, the results achieved and the use of its features as drivers of the success of the project and product. This requires a comprehensive analysis of the existing organizational, technological and economic potential in order to maximize the use of available resources and, most importantly, actively overcome resource constraints.

5. Controllability - the presence of certain criteria for the success of the project, tracking the timeliness, completeness of their achievement, guidelines for operational adjustment. Indicators of the effectiveness of the transformational strategy should be complex and characterize truly long-term trends. Such indicators are competitiveness, structural changes, development of entrepreneurial potential, income growth of the organization, etc.

6. Consistency and proactivity - setting a limited number of key project objectives, identifying ways for consistent implementation that would take into account: problems and challenges, goals, means of implementation, potential threats to implementation and performance criteria. Rational consistency is a determining factor in the success of the strategy [10]. However, since both the subjects and objects of the economic strategy are undergoing constant transformations, the directions, tasks and priorities, as well as the purpose of the strategy, are systematically changing. The strategy should provide for the activity of the whole achievement and the dynamism of criteria and priorities depending on the state of the project. An important characteristic of an effective strategy is the consistency of mission goals and a vision of the future.

7. Structural perfection. According to management theory, any effective strategy should contain three components: the main mission and goals, the main elements of the policy, the sequence of main actions. Therefore, an important feature of an effective strategy is its structural integrity and the inseparable unity of the foundations of construction and implementation practice. An effective strategy must also include a hierarchy of strategies aligned with the higher-level strategy [11].

8. Accounting for external influences. Attempts to build a strategy should be abandoned, taking into account only purely internal factors and problems, ignoring the factors of influence in the environment and the processes of globalization. The internal

strategy of the project must be implemented in a complex, taking into account the actions of others. The formation of an effective strategy is a rather difficult task and its complexity is directly proportional to the degree of uncertainty, the influence of the expected external and internal factors of the project on the implementation of the strategy. Important elements of the circular economy in the context of managing construction objects are its three approaches (Table 1).

First of all, a number of objective problems hinder the formation of an effective strategy. Among them are [12]:

- the actual strategy of the project certainly differs from the planned one, since it flexibly responds to changes in the internal and external environment;
- the plan for the future is built on the basis of past experience, so the impact of extrapolation ("rational" expectations) may be too high;
- the capabilities of the organization often do not coincide with the intentions of the project, dictated under the influence of certain non-systemic circumstances;
- purposefulness and predetermination of the directions of the strategy are combined with the need for flexibility and innovativeness of strategic tasks;
- there is a merging of value, economic and other factors that are formed on a different methodological basis;
- the organization must simultaneously respond to changes within and in the external environment, resisting both internal and external factors;
- the means of implementing the strategy should have a specific focus and influence the implementation of the project or program of systemic changes;
- centralized planning, emerging from a single center of the organization, is combined with flexible project implementation technologies.

| <i>Nº</i>  | <i>The main approaches</i>  |
|------------|---|
| Approach 1 | Conserve and enhance natural resources by managing limited reserves and balancing renewable resource flows  |
| Approach 2 | Optimize resource attrition by circulating products, components and materials with high utility throughout the life cycle at all stages in both the technical and biological cycles of operation and disposal |
| Approach 3 | Promoting the development of systems efficiency by identifying negative externalities and then redesigning the activities of project products   |

The basis of measures for environmental protection is the principles of standardization of the quality of the natural environment. Modern world standards for the regulation of environmental parameters of the architectural and construction industry mainly relate to the environmental, energy and economic efficiency of the so-called "Green buildings" (green building) and are developed as a system of voluntary rating certifications [13]. The most famous of them are the English BREEAM and the American LEED. The mechanisms of these systems, in turn, are developed on the basis of monitoring environmental indicators, namely: monitoring the state of the biosphere, assessing and forecasting its state, identifying factors and sources of impact, determining the degree of anthropogenic impact on the environment [14].

Taking this into account, the management of construction projects should be formed on the basis of the following basic imperatives [15]:

1. The principle of leasing: the consumer treats products responsibly (does not throw away the product, does not destroy it), because he did not buy it, but rented it or rented it, therefore he must return it after deal term. In the construction industry, there is a prospect of a market for development companies that would not only accompany the object as developers, but also owners-lessors, renting out their own objects.
2. The principle of enrichment without consumption: due to the recycling of resources, economic growth occurs without an increase in the consumption of natural resources. In construction, it is the recycling

Table 1: The main approaches of the circular economy in the context of construction project management

and reuse of building materials. Today, almost all construction production in Ukraine operates according to a linear model: the use of fossils in the manufacture of building materials and structures, disposal in landfills with partial recycling of building scrap in infrastructure construction. In contrast to this model, Europe recycles up to 90% of construction waste.

3. The principle "Efficiency above all": the requirement to ensure maximum efficiency of each process in the life cycle of a product or service. According to a number of experts, achieving this efficiency is the main principle of the circular economy. In the construction industry, this is the way to develop, implement and use best construction practices at all stages of product manufacturing.

4. The corporate principle of the success of new products: all participants in the economic chain create a new product, moving in the same direction to ensure a common result. The implementation of this principle is a consequence of the principle of efficiency while achieving the maximum effect at all stages of production. For the construction industry, the chain "Producer" - "Consumer" takes into account the work of not only developers (organizers), but also manufacturers of building materials and structures, suppliers, directly builders and operating companies.

5. The principle of durability: the requirement for a longer product life cycle is aimed at establishing the production of products with a long consumption (operation) period. This principle is the most difficult to implement, since it goes against the idea of parameterization (setting a warranty or fixed service life) of products on which modern business is built. The production of durable goods creates additional costs for the manufacturer and deprives the "quick" profit. The introduction of the idea of parametrization of the life cycle of a building object based on BIM technologies (Building Information Model) made it possible to update the development of architectural, constructive and technological solutions. Information technologies in the economy are aimed at the possibility of a functional transformation of an object during its service life. The concept of functional transformation consists in changing the functional load on a building object during the life cycle by changing internal (and partially external) architectural and structural solutions with minimization of investment funds. Such an approach

at the stage of development of design solutions opens up additional ways for the developer-lessor to make a profit in the future.

6. The principle of deferred profit: the costs of creation are compensated at the stage of service and support of the product. Instead of a one-time profit from the sale of the final product, the manufacturer remains the owner and receives cash as a lessor that fully complies with the principle of renting products. For the construction industry, with the current level of technological development, one of the ways to make a profit is through the export of construction waste to ecologically technologically developed countries or the opening of a market for secondary building materials.

#### 4. Conclusions

One General strategies for sustainable development of all sectors of the economy should be based on the observance of the conceptual foundations of the circular economy, environmental management, resource provision and development of the country, namely:

- anthropotechnogenic pressures on the environment, biospheric resources and objects should not exceed the possibilities of their natural reproduction, restoration;

- production technologies used in the economy should be based on the principles of biosphere compatibility of production, as well as on effective methods for neutralizing and restoring used resources to a biological quality sufficient for return to the environment;

- economic activity should be carried out with obligatory consideration of environmental factors, requirements and restrictions in order to prevent irreparable damage to the biosphere, undermining its biopotential and ecological balance.

For the greening of the economy, it is necessary to shift the center of economic analysis of costs and intermediate (short-term) results to the final (long-term) results of economic activity and further to predicted development trends in accordance with the principles of social responsibility. The closest model to these tasks is the circular ("green") economy model.

Biosphere-compatible building strategies should also be based on the principles of sustainable development and the circular economy, namely:

- attraction of renewable environmental resources to economic categories that affect the cost of the final product;
- transition to a new pricing system that takes into account environmental factors, losses and risks;
- attraction of construction enterprises to the system of financial and tax stimulation of environmentally friendly and risky industries;
- significant expansion and refinement of the system of payment for nature use;
- subordination of design technological and economic solutions for the production of products to environmental restrictions and the principles of balanced nature management;
- technological re-equipment of the construction industry under environmental and economic control.

However, the main stabilizing factor of the "man - economy - environment" system at the formal level is a rather simple principle of the circular economy: a decrease in natural resource consumption in the production of products, which is possible only with a decrease in the volume of the same production. Therefore, one of the main priority areas for the development of the construction industry is the reorientation of the technology of recycling construction products and the functional transformation of an object during its service life with the minimization of investment resources due to the universalization of initial design solutions.

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