INFORMATION SYSTEMS IN PROJECT AND PROGRAM MANAGEMENT

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INFORMATION SYSTEMS
IN PROJECT AND PROGRAM MANAGEMENT

Collective monograph
edited by I. Linde

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The monograph presents the achievements of Ukrainian scientists in the field of business management, use of economic and mathematical modeling, information technologies, management technologies and technical means in the field of functioning, development, and project management at enterprises.

The publication is recommended for professionals in the fields of economics, information technology, project and program management - for undergraduate and graduate students, as well as academics and teachers of higher education.

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CONTENT

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MODELING INTEGRATION STRATEGIES IN BRANCH PROJECTS

Bulavin D., Petrenko V.

The widespread use of project management methodologies shows a fundamental shift in the way organizations are trying to cope with the complexity and volatility of the external environment. In large-scale projects, integrating the work of many people often leads to conflicts in teams, but at the same time, it also contributes to the creation of innovative solutions. We explore promising strategies for managing integration in projects to describe different approaches to teamwork strategies. These types of strategies are illustrated by individual components and are relevant to large organizational projects. The implementation of the proposed scientific provisions will increase the efficiency of the implementation of projects to create new products and services of the enterprise.

Introduction

Nowadays, businesses and organizations operate in the era of the knowledge economy and are based on the use of modern information technologies. Given the current state of information technology, every enterprise needs to support its products at all stages of the life cycle. An important aspect of the company's activities is the adequacy of the level of knowledge, skills and abilities of managers to apply knowledge to implement specific tasks. Taking into account these features, it is advisable to carry out activities to create an integrated information environment of the enterprise on the basis of project management methodology [1].

Review of scientific literature on the topic

The search for methodological foundations for managing qualitative transformations in a company was marked by the emergence at the end of the last century of the ideology of continuous improvement management by E. Deming, the modern theory of innovation by P. Drucker, and the concept of business process reengineering by M. Hamer and J. Champy. Modern models Capability Maturity Model Integration (CMMI) and Process Assessment Model (PAM) are aimed at the technical maturity of the company in the field of IT, but do not fully take into account the managerial component of the internal environment of the enterprise. According to many researchers, integrating project management methodology into management processes provides companies with a real chance to provide organizational and resource support for the implementation of the company's strategy. Such problems have received considerable attention in the works of foreign and domestic scholars, in particular: Bushuyev S.D. [2], Koshkin K.V. [3], Molokanova V.M. [4], Chernov S.K. [5], Chumachenko I.V. [6]. However, the analyzed sources do not contain specific methods and models that allow to ensure the formation of an integrated information environment of an enterprise.

The purpose of this study is to solve the problem of managing the organization's integration process by the criteria of efficiency and timeliness of strategic decision-making.

Presentation of the main material

Only recently, it was a strange statement that the SPOD-world (steady predictable, ordinary, definite) had changed to the VUCA-world (volatile, unstable, complex and ambiguous). But such a world was not going to stabilize its course, and now people have to adjust to the BANI-world (brittle, anxious, nonlinear, incomprehensible). In the space of growing chaos, it is already clear to everyone that people's old ideas about economic models and management tools no longer work.

The previously dominant scientific management-oriented methods [7] and the shift to more general lean and agile development methods mean a shift in strategies for dealing with complexity and variability. Incomplete and constantly changing requirements, together with complex interdependencies between requirements and existing software, are just some of the attributes of the problem outlined. The first steps in describing this complex context were made by DeGrace and Stahl [8], who called software development "bad problems". More recently, the Cynefin Framework (see Fig. 1) [9] has emerged to define the relationship between working conditions and possible approaches to solving adaptive systems problems [10].

Integration is a way of organizing individual components into a single system that ensures their coordinated and purposeful interaction. Modern researchers rarely distinguish the integration of projects in a portfolio as a separate concept. As a rule, the concepts of "dependence", "coordination", and "communication management" are analyzed. In the domestic and foreign scientific literature, there are approaches to explaining the success of a portfolio in the context of deviations from the planned goals, results, and trajectory.

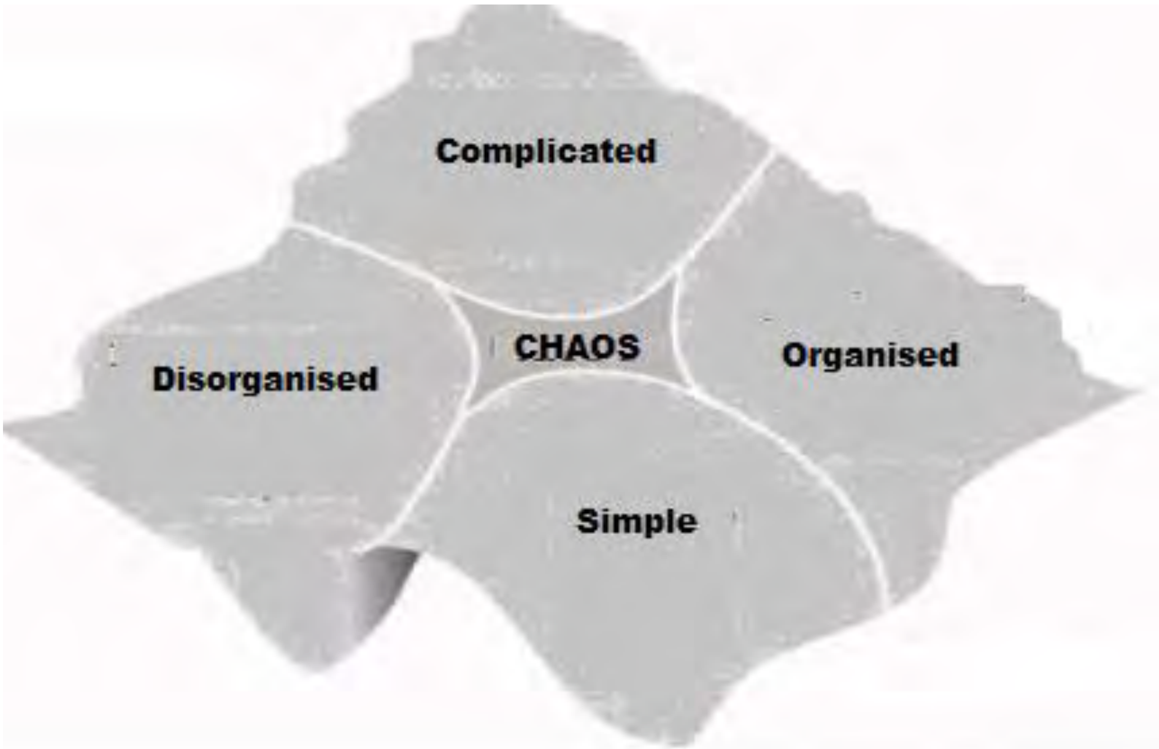

Fig. 1. Cynefin framework [9]

Coordination is a multifaceted field of study that includes, but is not limited to, various fields such as economics, organization theory, and computer science. Integration theory provides a framework for coordination analysis because it defines coordination as the management of dependencies. These dependencies must be managed by coordination mechanisms. However, no predictive power is derived from this theory, as neither hypotheses nor propositions are formulated [11]. Crowston et al [12] recognizes these limitations and calls for further research and the development of testable hypotheses.

The study of integration in organizational theory has revealed several mechanisms for integrating employees. For example, March and Simon in their study [13] identify three main approaches to integration: standardization or rules, plans, schedules, and mutual adjustment. Van De Ven et al [14] added a fourth new perspective on team influence, which extends mutual adaptation through joint simultaneous interaction with neighboring teams. Similarly, Mintzberg [15] suggests mutual adjustment, direct control, and standardization of work processes, i.e., the introduction of standard procedures into employees' skills as the main mechanism of integration.

In an attempt to classify integration mechanisms, Espinosa et al. distinguish between three types of integration: mechanistic, organic, and cognitive coordination.

Mechanistic integration involves coordination according to plans and rules with a small share of personal communication. Organic coordination refers to mutual adjustment or feedback through joint interaction. That is, team communication can be both formal and informal, spontaneous. Cognitive coordination is based on the knowledge and judgments that managers have about each other and is achieved implicitly. Cognitive coordination is viewed as a key enabler of mechanistic and organic integration.

A similar position is also supported by Rentch and Stanievich [17], who propose to consider cognitive similarity as the main driving component of integration in project teams. All of these types of integration differ in the structure of similarity and forms of cognition and can be used to formulate a general strategy for the development of a manufacturing enterprise (see Fig. 2).

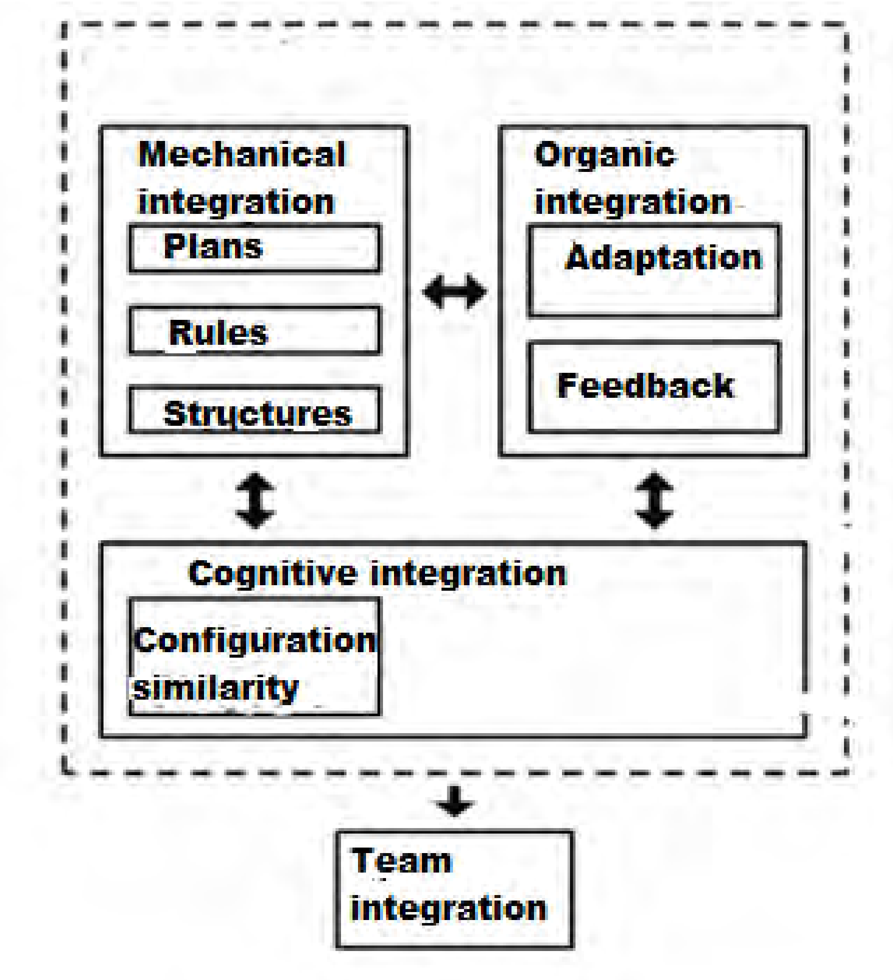

Fig. 2. Conceptual framework of strategies (adapted from [16])

This conceptual framework demonstrates a theoretical understanding of the process of effective team integration and the peculiarities of the interaction of mechanistic, organic, and cognitive integration mechanisms within the organizational strategy. Next, we consider certain types of projects inherent in the food industry, highlighting individual components of strategies. In accordance with the previously presented concepts of mechanistic, organic, and cognitive integration, we consider the conceptual archetypes of integration mechanisms within innovation projects. Table 1 shows the possible types of enterprise development strategies, taking into account the low and high degree of individual components within these strategies.

The findings allow us to create a matrix of combining mechanistic, organic, and cognitive integration (Fig. 3), based on the criteria in Table 1.

Type 1 strategy is characterized by high mechanistic, low organic, and low cognitive coordination. This archetype describes the ideal approach to planning the development of a production retooling. While coordination within teams may well be achieved through organic or cognitive mechanisms, the focus of team integration in this strategy is exclusively on mechanistic coordination with little communication between individual members.

This type of strategy assumes that the project development can be planned through full pre-planning, where all contingencies can be identified and accounted for in advance. Since such an integration is planned based on formal communication by a very small group of people, it is necessary to have a deep understanding of all the technical details of the system, the individual work packages, and the proper integration. While this type of strategy is quite plausible from a theoretical point of view, it has serious drawbacks for large projects, especially in the field of innovative technologies where requirements are constantly changing. This type of strategy can be illustrated by the previously presented complex framework, such as the Cynefin Framework (Fig. 1).

Table 1

Types and degree of influence of strategy components

Strategy types	Mechanistic	Organic	Cognitive
1	High	Low	Low
2	Low	High	High
3	Low	Low	High
4	High	High	High
5	Low	High	Low
6	Low	Low	Low

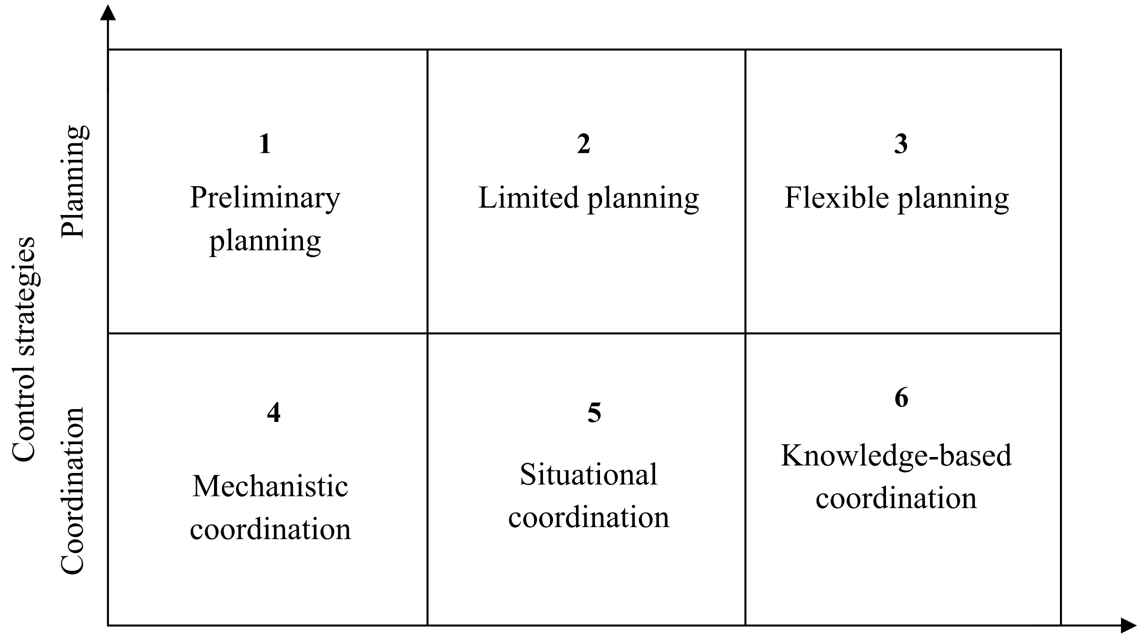

Fig. 3. Matrix for combining mechanistic, organic and cognitive integration

The leadership paradigm of "sense, analyze, and respond" is the basis of the Type 1 strategy. First, the problem space of the project is understood (sensed). Usually, a small group of people (including, for example, the chief engineer) analyzes the problem and develops a conceptual plan and a calendar plan (schedule). Accordingly, in this case, the main goal of the project is the implementation of these two plans (project implementation phase).

Type 2 strategy can be seen as the antithesis of type 1. As the mechanistic coordination is based on a high level of planning, strategy 2 relies on organic and cognitive mechanisms to achieve integration efficiency. This strategy may differ in the number of organic and cognitive management measures, but it always maintains a high level of organic integration. Strategy 2 recognizes that there are limitations to the planning capacity of individuals and small groups. However, pre-planning is seen as a necessary step to achieve overall coherence among individual team members and reduce unnecessary rework. To achieve effective integration, teams need to communicate comprehensively and mutually adjust their actions, which relies heavily on feedback and a common understanding or shared knowledge base. This calls into question the initial division of the team into individual performers. Less reliance on pre-planning and rigid rules allows for a more collaborative leadership paradigm, more exploration, feeling, and response. In line with the principle of project agility, you can experiment with requirements and present prototypes of solutions to the client to test and respond to the idea.

Type 3 strategy requires high cognitive coordination. This is difficult to achieve in reality, as it would be necessary to hire individuals who already have a high affinity, for example, by developing projects with the same people. Since cognitive coordination needs to be established in some way between team members, the use of mechanistic and organic integration in this strategy may hinder the establishment of the cognitive component.

In a Type 4 strategy, coordination is not an end in itself. Its right to exist depends on the actual tasks and work to be done. Intentionally implementing this strategy will mean accepting the high overhead of coordination with unclear benefits over other strategies.

Type 5 strategy is low in mechanistic, high in organic, and low in cognitive coordination. If the organic coordination activities are carried out without any shared understanding or knowledge exchange on which to communicate, this strategy promotes aimless communication and feedback. While Type 5 is not typical for achieving effective integration, it can be an intermediate state between Type 2 and Type 3. This strategy relies heavily on plans and rules with little or no communication, whereas organic coordination is communication-based. Type 5 strategy is rather implausible from a theoretical point of view, so it is considered to be rare.

Type 6 strategy shows poorly coordinated activities in any of the three types of integration. Although theoretically, the absence of integration in the discussion of coordination strategies seems to be a bad approach, sometimes this strategy can contribute to effective cooperation.

Conclusions

The provided analysis makes it possible to visually evaluate integration management strategies in organizations engaged in project activities. The proposed model for solving the problem of integrating project teams is considered as the basis for a methodology for assessing the viability of a project-oriented organization based on the laws of system development.

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