



Creation of a Unique Automated System for Calculating Salary, Bonuses and Premiums

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ABSTRACT

The problems of administration of the payment system are taking on increasingly strategic importance for companies in the modern world of economic digitalization and increasing significance of human resources. The new methods of computation of wages and premiums are characterized by a not very high level of flexibility and adaptability to changes in the surroundings, that causes to the necessity of designing individualized automated systems that can combine finances, HR and analytical functions into one information system. Current automated payment systems operate as typical calculation systems and contain minimal functionality for adaptation to the individual motivational policies of the companies. Low integration level with staff performance indexes decreases the effectiveness of the application of premium and bonus payment systems. Thus, the problem of the creation of an integrated system of accounting, analysis and management of the staff remuneration gains actuality.

KEYWORDS

automated system, salary, management, human capital, digitalization, staff motivation, information systems.

Introduction

In conditions of economic digitalization and increasing role of the human capital in the economy, efficient management of the remuneration system for the enterprise becomes strategic. Modern methods of accounting for wages, bonuses, and compensations cannot provide the necessary level of transparency, flexibility, and mobility to the changing environment and require the development of individualized automated systems capable of uniting financial, human resources and analytical processes in a single information environment. The implemented automated systems for accounting for wages are oriented towards the standard algorithms for calculation, which provide insufficient adaptation to individual enterprise motivation schemes. The limited integration of these systems with the performance criteria of personnel causes the depreciation of motivating components of bonus and compensatory systems, the importance of which grows. In this regard, the issue of developing a universal integrated system for accounting, analysis and management of remuneration systems for personnel is being constantly raised.

During the scientific research of the problem, a group of general scientific and special methods was used. Research on modern ways of automating payment systems was conducted, major problems of their practical implementation were revealed, and the expediency of the creation of a new independent automated system was reasoned. Conceptual model of the system of calculation of wages, bonuses, and stimulants was elaborated and its basic function modules were determined.

The findings of scientific examination show that the introduction of a specialized automatic system for the accounting of wages, bonuses and premiums promotes more transparency in the calculations, lower risk of making errors and a rise in workers' motivation. Thus, it is advised to use the described system in all industries and in enterprises for optimizing the wage calculation management system, to make the incentive policy of the company flexible. The practice of the results of the examination should be connected with the adjustment of the system to the enterprise's organizational structure and to its targets.

The object of the study is the system for the calculation of payrolls, bonuses and premiums as the object of digital transformation.

The subject of the study is the process of digital transformation and development of a comprehensive system for the calculation of payrolls, bonuses and premiums for organizations operating in a modern environment.

Modern stage of economic development characterized by an all-encompassing digital transformation of business processes; within this, a system of payroll calculation, bonus and premium accruals ceases to be purely an accounting task and emerges as a critical instrument of strategic personnel management. Pay rates directly impact employees' motivation, performance, engagement and retention, as well as the financial stability of the company. Competition for skilled employees, increased use of flexible employment arrangements and remote working create additional pressure on the system to ensure accuracy, transparency and efficiency of payroll calculations. Despite automation, the majority of existing payroll calculation systems do not adequately address the current organizational needs. Common drawbacks include the fragmentation of information, the inadequate level of integration with HR, finance and management subsystems, and the reliance on manual adjustments, which result in errors in payroll calculations, payment delays, increased administrative expenses and the erosion of employee confidence in the payroll calculation system. Calculations of bonuses and premiums are becoming more complex since they are increasingly dependent on multifactor performance indicators, key performance indicators (KPIs) and performance results of work teams and individuals. In typical automated systems, such processes are implemented minimally or necessitate complex modifications, which, in turn, limit the flexibility of motivational policy management. Organizations end up using parallel calculations, spreadsheets and unofficial algorithms that are inconsistent with digital transformation principles and increase operational risks. In connection with the foregoing, the scientific and practical problem is the absence of an integrated approach for the development of a universal automated system of payroll calculation, bonus and premium accruals, which will combine the advantages of motivational mechanism flexibility, business process integration and high accuracy of calculations while observing current legislative

requirements. Thus, the problem requires the development of new scientific and methodological approaches and models that can ensure the optimal operation of the remuneration calculation system in a dynamic and digitized economy.

Literature Review

Issues on the process of creation and improvement of the remuneration system and automation of calculating wages, premiums and bonuses processes under the conditions of economic digitalization were studied in several domestic and foreign research papers by such scholars as Pyzhova M (2020) etc.

Particular interest is drawn by Zudova & Bolharova (2018), S. Tsybalyuk (2014), where the theory principles of organization of remuneration, compensational remuneration models, socio-economic and safety aspects of human capital formation, as well as the importance of competitive pay system as a means of rise of competitiveness of enterprises are disclosed.

Emphasizing the earlier unanswered aspects of the problem. The problem of rational use of export-oriented development of the national economy is complex due to the fact that the usual means of export stimulation and formation of potential under conditions of instability prove to be not so effective, or need serious modification. Lack of a balanced approach to formation and use of potential, which would consider risks, restrictions and structural changes in the global environment, limits possibilities of steady growth of the economy, hence requires further theoretical and methodological grounds in studying the processes of formation and use of potential of export-oriented development and determining ways of enhancing efficiency of implementation thereof.

Problem Statement

The purpose of the article is to scientifically justify the conceptual and methodological bases for designing an individual automated wage, bonus and premium accounting system which can ensure motivational mechanisms' flexibility, integration into business processes of an enterprise, transparency of accounting and adherence to present-day digital transformation and regulatory framework needs.

Methods and Materials

The study used methods of analysis and generalization of scientific sources to determine modern approaches to payroll management in the context of digitalization. System and structural-functional approaches were used to justify the construction of an automated payroll system that integrates financial, personnel and analytical processes. The modeling method was also used to develop the concept of a comprehensive personnel compensation management system, taking into account employee performance indicators.

Results and Discussion

In the modern world, the systems for the automation of salary payment, bonuses and awards are developed in three vectors: (1) digitalization of the process of accounting and calculation of remuneration; (2) integration of payroll calculations with the processes of staff and finance; (3) movement from rigidly set schemes of payment to flexible ones, which reflect behavioral and result-based factors. In the majority of organizations, automation processes began with the transfer of calculation of salary and bonuses from handwritten accounting records to special software. Currently, importance is given not so much to "correct" calculations as to: clarity of accrual logics, manageability of changes, auditing, as well as rapid change of system according to new realities. The largest category of solutions includes payroll modules integrated into ERP/HRM systems or fully formed HRIS platforms. Their main advantage is the centralization of all relevant data (staff, structure, timesheets, orders, accounting) and the formal consistency with financial accounting forms. Such solutions can be quite efficient in large organizations where clearly defined processes and functions

are established. The disadvantages can be: the cost of the license and its implementation, the complexity of setting up non-standard bonuses and premiums schemes and a lengthy cycle of changes, each modification of motivational logic can bring in consultants and developers, as well as lengthy testing phases.

Another solution is to use dedicated payroll solutions (or services) that only focus on the correctness of calculation, taxation, reporting and automation of recurring operations. The benefits here are much quicker implementation, periodic updating of the system in accordance with legal changes and the convenient forms for mass accruals, re-accruals, and regulated forms. In the section about premiums and bonuses, however, these systems support mostly "standard" options: they are great with fixed allowances and one-off bonuses, but with implementing the logic for combined schemes, formulas, multi-tier KPIs, dependence on the project and the like, it's more challenging. A separate cluster should also cover cloud services and the "payroll as a service" model, where some of the processes are outsourced to a third-party or a managed service. A strong benefit here are less internal IT resources being used, guaranteed stability of updates, ability to scale up and fast addition of new divisions, however the limitation often include a lower ability of a solution to adapt to very individual business incentive schemes, risks of vendor lock-in, longer approval of any changes or unauthorized access to personal data, The crucial point of debate will be for the companies themselves and not only about speed and controllability, how much can a service be tailored to custom incentive schemes (Perehudova, 2014).

It is also a growing trend to integrate payroll with management of performance (KPI/OKR, time, project accounting and BI), which presents quite a serious advantage - bonus & bonus can be calculated based on the actual results and management is given tools to forecast the payroll, evaluate productivity and run "What if" scenarios. The greatest complexity in the integration is the described case. Information comes from different sources, has different quality, time relevance and rules of interpretation. Without a unified system of directories, versions of indices and processes of verification, integration will likely not decrease but increase manual reconciliations and disputes on "right" values of KPIs.

In reality most organizations have used a hybrid: the basic accruals occur in the payroll system, the bonus portion "lives" in the rules, table or local applications and the result is imported as an adjustment in the system, the strength is the maximum short-term flexibility (especially in the case of rapid changes of incentive mechanisms), the weakness - a high level of operational risks, a low level of calculability, a low level of reproducibility and lack of audit of calculations and of their "explainability" (why a given amount has been accrued), as well as a poor level of access management and version control of the rules, it is these shortcomings that cause the need for each successful enterprise with a mature variable pay scheme to have a special automation system or superstructure for formalization of incentive rules, information integration and to guarantee the understandability and manageability of the calculations (Cheliadinova & Kudelia, 2022).

Digitalization of business processes results in radical changes in the methods of development and application of a remuneration system within companies. The shift of the wages from an accounting category into an instrument of personnel strategy formation implies the transfer from manual and semi-manual methods to automated process control, from speed and accuracy of the calculation, from uniform, centralized accounting and calculation of all data to transparency and repeatability of calculations, the essential condition under the growing complexity of schemes of motivation (Table 1).

Simultaneously, digitalization makes the payment system more complicated. Except for the stable part of payment, the stable payment of performance, individual and team indicators and projects plays an increasing role. The complex algorithm calculation, an information system that can process a large volume of data and can combine information from various information systems (HR system, time tracking, KPI, financial system etc.) in a digital environment, is demanded for implementing bonus calculation and premium payments. Changes in employment form directly influence the transformation of the salary payment system. Remote and hybrid forms of employment, project-based contracts, the gig economy, and workers from various regions and countries result in less efficiency of the traditional accounting method for working hours and salary payment. For these varied forms of employment, the payment system should consider not only working hours but also

working outcomes and contributions. The new form of employment is leading to a new employee expectation for salary payment, such as flexibility, personalization, transparent calculation and speedy access to calculation data. Therefore, companies have to provide digital self-service platforms, dashboards and intelligible algorithms in order to develop the architecture of the payroll system directly.

Table 1. Summary table of the impact of key factors on the remuneration system

Influence factor	Key changes	Implications for the wage system	Requirements for automated systems
Digitalization of business processes	Transition to digital platforms, data integration	Complicated accrual structure, increasing role of variable part	Integration with HR, finance, KPI; automation of complex algorithms
Hybrid and remote work	Reducing the role of timekeeping	Focus on results, not just hours worked	Support for performance-based reward models
Project and gig employment	Temporary contracts, various formats of cooperation	Heterogeneity of payment schemes	Flexible setup of rules and reward types
Rising employee expectations	The need for transparency and personalization	Increasing requirements for the explainability of accruals	Self-service, dashboards, detailed calculations
Regulatory requirements	Frequent legislative changes	Increased risks of errors and sanctions	Rapid adaptation of rules, auditing, logging
Personal data protection	Strengthening security requirements	Access restrictions, liability for violations	Access control, encryption, data versioning

Source: Summarized by the author

Another significant force of change is the regulatory sphere in the sphere of labor relations, taxation, and protection of personal data. Constant legislative changes, requirements for the transparency of calculations, opportunities for an audit and confirmation of the accuracy of the calculations make it extremely difficult to manage the payroll system. Automation systems are called to keep up with this pace, to quickly adapt accrual rules, store the history of their changes, and guarantee control over access to private information. On the whole, it should be noted that digitalization, change in employment relationships, and intensification of regulatory requirements lead to multifaceted consequences on the payroll system, changing its goals, structure, and implementers. Rigid, static forms of compensation give way to more flexible and flexible, data-driven systems which can be implemented only through modern automation tools. The operation of traditional systems for calculating payroll, bonuses, and premiums within organizations causes various systematic issues and inconsistencies that are directly related to reducing personnel management efficiency. As a result of a formal automation of calculations, traditional systems do not meet the modern demands for system flexibility, transparency and strategic orientation of compensation. Therefore, it ceases to fulfill the motivation function of compensation and is perceived by employees as more of a technical instrument of management, but not management itself. (Liadskii, 2020; Samoliuk & Mishchuk, 2021).

An original automated system for wage, bonus and premium calculation (hereinafter - the System) is understood as an integrated digital platform, where personnel accounting, time/results accounting, rules of motivation and financial calculations are tied together into a unified managed circuit. Its idea is based on the fact that remuneration should not only be the product of accounting calculations but a managed element to motivate and manage human efficiency. It means that the System must simultaneously: provide accruals correctness, transparency for an employee, change management for HR/Finance, auditability for audit and integrate with other enterprises' IT systems (Table 2).

The conceptually designed model is based on a "single source of truth" for catalogs and primary data (staff, positions, rates, schedules, events, timesheets, KPI's), which means that the system should be with "master" catalogs (or synchronize with the company HR / ERP system) so that there should not be duplicates of identical information. A calculation circuit is the core of the System, calculating primary accruals (salary, time pay, surcharges/increments) and allowing multivariate calculation scenarios (full/part-time working, partial employment working, different rates in period, vacations/sick-pay, etc.) An important characteristic that will make a System unique is the Rules Engine module which will formalize bonuses and premiums' logic into parametrized rules, formulas and conditions with version support. Such a module will separate "business logic" (payment policy,

KPIs, triggers, factors) and “technical implementation”, minimize the amount of hand calculations and manual fixes. So the company can alter the motivational model very fast (e.g., add new KPIs or change the weight of given indicators) without damaging system stability during basic payroll calculation (Diadyk, 2019).

Table 2. Functional modules and purpose

Module	Appointment	Key outputs/results
Integration and References Module	Synchronization of HR/ERP/Time/KPI data, elimination of duplications, unified directories	Consistent data for calculations, stable identifiers, source of truth
Data collection and validation module	Quality control of timesheets, KPIs, events; rules of correctness and completeness	Validated set of indicators and events for calculation
Payroll Core (basic accruals)	Salaries/hours/benefits/withholding/taxes/recalculations	Calculation information, accruals and deductions for each employee
Rules Engine (bonuses/prizes)	Formalization of motivational schemes: formulas, thresholds, weights, conditions; versioning	Calculation of the variable part, management of bonus scenarios
Audit and explainability module	Logging, reproducibility, decryption of amounts, access control	Explanation of "why this amount", change history, audit trails
Analytics and planning of individual entrepreneurs	BI reports, cost forecast, KPI/bonus impact analysis	Dashboards, scenario planning, budget control for sole proprietors
Payments and financial integration outline	Payment registers, postings, cost centers, regulated reporting	Payroll files/registers, accounting entries, reports

Source: Summarized by the author

The creation of a non-standard automated system for calculating salaries, bonuses and premiums for companies in various industries is a staged management-and-technology process that needs to be synchronized with strategic objectives of the business, with personnel policy and with the current information technology base. At the first stage, it is advisable to perform a complete audit of the current payroll system, including examination of normative documents, motivational mechanisms, data inputs and methods of accrual. This process will identify areas of risk, duplication of efforts and manual operations that need to be eradicated at the time of automation. The formalization of the rules for calculating salary, bonuses and premiums in the form of clearly documented business rules and algorithms is recommended as a practical step (Gridin, 2023). Not only IT specialists, but also members of HR, finance and heads of key business units, should be involved in the process. This form of interdepartmental cooperation will ensure consistency between the motivational logic and actual business objectives, as well as between the technical implementation and management expectations. At the stage of calculation, it is desirable to implement a phased accrual (gradual connection of variable remuneration modules starting from basic accruals) and the application of double calculation on the stage of transition, when the new automated system operates in conjunction with the old one allowing to reveal the contradictions and errors, refine the algorithms and foster users' trust in the results of automatic accrual.

It is necessary to give special consideration to system transparency to employees. We recommend providing self-service functions where an employee has access to detailed accrual breakdowns and data about indicators and coefficients being used. This will significantly boost trust in the remuneration system, minimize the number of claims and appeals to HR personnel, and enable employees to understand how their performance correlates to the remuneration rate. Due to the sector-specific characteristics of companies, we advise designing automated system settings to be flexible. In manufacturing companies, we recommend an emphasis on interaction with production accounting and indicators of quality. In service industries, we advise an emphasis on productivity and customer indicators. In project-based industries, we advise emphasizing project contributions and teamwork.

The last point on practical realization is creating a system of control, analysis, and continuous improvement. It is advised to apply analytical modules to track the payroll, evaluate the efficiency of the motivation system, and make cost projections. Timely updating of rules on accrual of payments, application of employee and division chiefs' feedback, makes the payroll system keep relevant, increasing its motivational impact and alignment with the enterprise's strategic goals.

Conclusion

In conclusion, the proposed software solutions for the automated calculations of payroll, premiums and bonuses, despite the spread, cannot fully meet the requirements of enterprises during the digitalization of the business processes. A distinctive feature of software solutions under consideration is the rigidity, fragmentation of data, and the poor integration with the systems of management by personnel performance, that significantly diminish the motivational and managerial capabilities of systems that conduct calculations with employees, which supports the importance of searching new conceptual models for the construction of systems of this type.

Future work should focus on studying the ways to formally describe and algorithmize complex motivation models in automatic payment, bonus, and premium systems, taking into account the specific industry features of the enterprises, at a detailed level.

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