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Practical aspects of HR management in digital economy

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Practical aspects of HR management in digital economy

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Abstract. In the context of formation of digital economy and continuous introduction of innovations as well as reduction of permanent costs of organizations to management by automation of various business processes the automation of HR management becomes especially relevant as the organization personnel is its key capital. The modern level of development of information and communication technologies, availability of internet and various technical means allow to automate collection, storage and processing of personal data on potential or current employees, provide business estimation, provide 24-hour access to various educational resources. Consequently the range of suggested software and services is wide. The authors have analyzed the key functionality of integrated software solutions for HR management as well as possibilities of services automating individual personnel management processes for instance video interview, estimation, electronic training. As well the authors provided the recommended staged of introduction of automated systems to HR management. At the end of the article there are results of analysis of HRM systems at the Russian market, its tendencies and characteristics.

1. Introduction

The modern system of HR management cannot be imagined without the use of special software which allow to automate accounting of working hours, generation of orders as well as providing analytics [1], that provide optimization of taking managerial decisions based on wider use of corporate and personal information in the organization [2]. In such a case time to process, transfer and analyze the available information is materially reduced [3].

Initially the systems automating the HR management were developed on basis of software for accounting of payrolls and other accruals related to bonuses to personnel and settling budget and other funds' payments [4]. Further development of HR management automation allowed the following:

1) promptly generate various analytical reports and on their basis take substantiated managerial decisions on organization personnel [5];

2) optimize HR management process by reducing costs first of all due to elimination of duplication of some functions by different divisions of the organization;

3) create a database of organization employees which will be the basis to make analysis and planning processes efficient [6];

4) timely make adjustments to the database caused by law changes which is a preventive measure and allow to minimize possible punitive sanctions of inspection bodies [7].

Both foreign and local IT markets currently offer a wide range of software that enable automating both the whole HR management system in the organization and its individual subsystems.

The study is aimed to develop the stages and to determine the specifics of HR management automation at the enterprise.

2. Method of study

According to analytical estimation Forrester Research, the rate of growth of the global market of HRM information systems in the nearest future will be 9% that is higher than at the market of ERP solution with 3–4% of growth annually [8]. AMR Research investigators also mention that the market of personnel management information systems grows 2 times more intensively compared to the market of industrial application programs in general and according to forecasts the threshold of 10 billion USD annual sales volume will be overcome in the next 5 years [9]. The largest suppliers of HRM systems are Oracle, SAP, SumTotal, Infor (Lawson), Saba, Comerstone, Kenexa (IBM) taking half of the global market of HR management automated systems [10].

In Russia the market of automated HR management automated systems is represented both by global leaders and local developers such as '1S: Wages and HR management 8', 'Compass: HR management', 'Galaxy ERP: HR management circuit', 'BOSS-Kadrovik' [11].

The authors bring to a system the main functions of HR management which are automated in organizations that allowed generating the typical functionality of integrated HRM-systems (table 1).

Table 1. Typical functionality of integrated HRM-systems.

Section	Functions
HR record keeping	Develop organizational structure, develop and change staffing plan, arrange retirement, military records keeping, calculation of employment term, sick leaves and business trips, record vacations and leaves of various reasons, time keeping, etc.
Labour compensation and corresponding estimations	Calculate all kinds of bonuses and privileges, compensations and withdrawals of mandatory and voluntary payments
Human management in organizations	Choose and select new employees, estimate personnel in various fields, generate competency profile, plan career, optimize training and personnel development, estimate personnel performance, motivation management, etc.
Report and analytical processes	Generate reports on various aspects and for different purposes: current work of HR managers, submittal of aggregated information to company management, submittal of reports to governmental bodies

Besides mentioned above integrated HRM-systems there is local software aimed to automate individual functions of human resources management (table 2).

Table 2. Software aimed to automate individual functions of human resources management.

Software or online services	Functionality
1. Choosing and selection	
E-Staff Recruiter (developer — Datex Software)	Automated placement of vacations to all recruitment agencies and Internet resources, CV processing, forming a base of candidates, etc.
FriendWork Recruiter	Storage of resume and correspondence with candidate in a joint database, statistic determination of performance of recruiters and recruiting agencies, quick search of candidates profiles in social networks.

Software or online services	Functionality
AmazingHiring	Helps to find IT specialists which are not looking for a job at the momemt. The service aggregates data from more than 80 sources including Facebook, LinkedIn, My circle, GitHub, Stack Overflow and Harbahabr [12].
GoRecruit	Allows to evaluate and delete the candidates based on data from social networks, searches for information on enforcement proceedings.
JungleJobs Stafory	Companies place their vacations and dozens of recruiters (including freelancers) compete to close them.
VCV, Skillaz, Pre-Interview.	Video CVs and video interviews.
2. Business evaluation of employees	
SkillTech RetraTech (LLC 'Retratek')	Designed for external evaluation of IT specialists skills.
SHL, Talent Q, Cut-e and Kenexa,	Suggest verbal and digital tests for various occupations.
1S: Psycodiagnostics	Phycological testing.
3. Talent management	
SuccessFactors by SAP	Automate HR process in a cloud and analyze them by thousands of parameters.
Workday	Keeps a profile for each employee including contacts, position, depertment, subordination, career in a company. It also includes key purposes for each employee for a calendar year, task priorities, specialists development schedules [13].
4. Work time logging	
CrocoTime	Development of work schedule, assignment of lunch time, vacation time and consideration of periods of temporary incapacity. Allows to document effective and non-effective time of employees, track overtime and early leaves, absence and early leaves [14].
5. Loyalty estimation	
InfoWatch Traffic Monitor (JSC 'InfoWatch')	Allows to detect employees breaking rules of business correspondence using key words, which talk too much with non-employees, which copy too many information to external media.
SecureTower (LLC 'Falcongeiz')	Allows to keep records of employees work time, monitor visiting unauthorized sites or job search, makes pictures of desktop, provides statistics of using applications, helps to estimate psychological climate in a work team and determine the adaptation progress of new employees [15].
6. Communication by means of social networks and gamification	
Jive (Jive Software, Inc.)	Working groups are established in a corporate social network. In such networks the employees together implement various tasks, exchange experience and knowledge through this forming a corporate knowledge database. There is an informal part with likes, bages and comments.
NPeope	A corporate social network aimed first of all to evaluate performance of employees. The employees thank and compliment each other which is used to generate ratings and to give scores which can be exchanged to tangible assets.
'Pryaniki' (LLC 'Protection technologies')	Engagement and increase of motivation through gamification of employees using quests, competitions, mutual thanking and bages. It also enables creating groups, events bands, picture albums, reference list of employees and file storage.

It needs to be mentioned that today an important aspect of HR management in the organization is support and structuring of training and development process. Herewith remote electronic training methods become more and more popular. Table 3 gives a review of the most popular software and services to organize electronic training as well as their developers.

Table 3. Software and services for electronic training.

Software and developers	Properties
Platforms for webinars and online conferences	
Webinar and Comdi by 'Webimar-Comdi'	Organization of online conferences with simple questionnaires and demonstration of documents during the conference.
iMind by Mind Labs	Allows to hold webinars and support basic functionality (recording, desktop translation, demonstration of documents, chat, etc.).
Acrobat Connect Pro by Adobe Systems Incorporated	Special due to the fact that enables to access multimedia materials from any device at any time without additional add-ins (based on Adobe Flash Player). In a special training solution there is a capability to manage study materials, trach performance of students, generate new courses, etc.
Mirapolis Virtual Room by 'Mirapolis Information technologies'	Hold webinars and conferences with capabilities to arrange questionnaires, chatting, store materials, submit event materials, etc. Can be used on different devices.
'Virtual class' by WebSoft	Integrated to electronic training system WebTutor.
iWebinar	Acts as a tool to arrange video-conferences online in internet, can be integrated to training centre developed on basis of Learning Server.
WebEx, MeetingPlace by Cisco Systems	Over three million users. System has an integrated capability to hold questionairres and testing along with communication. Technically over 5,000 users can participate at a time, There is a special training solution — WebEx Training Center — capability to manage content, hold tests, trach performance, etc.
Packaged services[a] for electronic training	
WebTutor by Websoft	System of integrated automation of business processes related to choosing, estimation, testing and training of personnel, talent management, knowledge systemizing and storing as well as arrangement of corporate communications and interaction between the employees and HR department. As well the system has ready-to-use online-courses (effective presentation, marketing, etc.) and support of SCORM[b] format.
eLearning Server by 'HyperMethod'	Aimed to organize the whole cycle of remote and mixed training (including preparation of courses, testing and estimation of trainees, management of materials, etc.).
'Prometheus' remote training system by 'Virtual technologies in education'	Is exclusively a packaged software enabling to arrange remote training process (by means of such functionality as content management, testing, educational process planning, etc.).
Shareknowledge by Competentum	Enables unassisted arrangement of the whole process of remote training: develop courses, prepare and hold, manage knowledge. There is a set of products enabling to hold seminars, manage training, develop courses, estimate personnel, etc.

Software and developers	Properties
Cloud services (SaaS-services)[c] for electronic training	
Saas-version of WebTutor by WebSoft	Similar to packaged.
LMSOnline by 'Mirapolis Information Technologies'	Characterized by wide functionality: generation of full-featured training media, arrangement of webinars, trainees progress control, ready course in SCORM format are available, etc.
Competentum.ONLINE by group of companies Competentum	System functionality enables to control training process (including taking tests with various types of questions and modes of taking) but it lacks webinars organization module.
Teachbase.ru by 'Internet school'	Provides the most diverse set of e-learning tools so that various scenarios of educational process can be implemented: establish an interactive course, control of progress, testing, holding webinars, etc. [16].

[a] Packaged software is the one which is purchased one time, installed to a company server, then serviced and upgraded as the owner desires.

[b] SCORM (Sharable Content Object Reference Model) — collection of specifications and standards developed for remote training systems. Contains requirements to arrangement of educational material and whole remote training system. SCORM enables to provide compatibility of components and their multiple use: training material is divided into small individual units which can be used in various training courses and used in remote training irrespective of where, what with, by whom were developed. SCORM is based on XML.

[c] Cloud solutions are operated on developer servers and users access them by means of internet browser. User does not by the application but rents it and pays a monthly use charge.

3. Deliverables

Considering that the market of HRM-systems is represented by such a wide range of integrated and local products, the organizations planning to introduce these systems to its practical activity should implement this process following a special algorithm that will allow reducing financial and time resources to implement such projects [17]. So irrespective of the selected software the HR management automation should be implemented in the following stages:

1) determine the purpose of automation process;

2) make a list of necessary functions of automation system;

3) determine a category of software product;

4) choose software product considering tasks and purposes of the project. In this regard it needs to consider not only the correlation of price and functional volume but the flexibility as well as adaptability of the system to specifics of each particular organization as well as specifics of current labor laws of the country;

5) introduce and support the system which should be supervised by HRM manager and IT manager of the client organization [18].

Further the authors detected the specifics of HR management in Russia. The main difference of local HR-systems from foreign ones lies in the approaches to HR management. The foreign HRM-systems are developed according to European and Western-American management models focused on overall estimate of employees by various methods the results of which enable us to take substantiated managerial decisions in the field of motivation, personnel training and development, career management, etc. [19].

According to the results of the study taken in 2015 by HeadHunter portal local organizations first of all pay attention to automation of personnel recording and administration automation (74% of respondents). The second most popular (chosen by 35% of respondents) is the personnel selection and adaptation process. 27% of respondent organizations automate payroll accounting and wage payment system, 23% — automate HR-analytics. The same number of respondents — 21% use software to automate personnel estimation, training and development as well as for internal communications. Besides it needs to be mentioned that among the respondent companies within the framework of the

indicated study there are organizations (15%) where personnel management processes are implemented manually [20].

The indicated specifics of the local approach to HR management as well as specifics of demand of HRM services consumers determine the functionality of software developed in Russia. They pay more attention to the formal side of labor relations, HR records keeping (for example, to make a personnel chart, leave schedule, etc.) and to calculation of the main and additional labor payment, various bonuses and privileges considering law requirements. But according to the wording of the head of the largest business software developer in Russia '1S' local software can also be used to select and estimate human resources of the organization [10].

4. Conclusions

Thus HR management automation today is an entity nearly in every organization. Along with that it needs to be mentioned that though automation in any area promotes decreasing costs, optimize business processes, aggregate a large database which are undisputable advantages but there are some areas in HR which cannot be totally automated and computerized. First of all they are psychological aspects of labor activity: establish an organizational culture and develop staff morale in a labor collective.

5. Further study directions

Further the authors suppose continue the study of HR management automation in such directions as to study the degree of automation influence to the performance of the organization and to develop method to estimate the economic efficiency of such procedures. Beside from the researchers' point of view the issues of influence of digitalization of business processes to organizational culture and staff morale in the organization are important as well as the use of automated systems which are causing material changes including release of personnel. The indicated factors make the personnel feel economic insecurity that can reduce their performance. In this regard it will be reasonable to take studies devoted to smoothing of social conflicts in the digital era.

Reference

[1] Babkin A V, Burkaltseva D D, Kosten D G and Vorobiev Yu. N *2017 Scientific-technical bulletin of Saint-Petersburg State Politechnical University. Economy sciences* **10** (3) 9–25.

[2] Strohmeier S and Parry E 2014 *Employee Relations* 36 (4) https://doi.org/10.1108/ER-03-2014-0032

[3] Strohmeier S and Ruediger K 2014 *Employee Relations* **36** (4) 333–53

[4] Tansley C, Kirk S, Williams H and Barton H 2014 *Employee Relations* **36** (4) 398–414

[5] Obeida S M 2016 *Personnel Review* **45** (6) 1281–1301

[6] Aligning the e-HRM and Strategic HRM Capabilities of Manufacturing SMEs, https://www.emeraldinsight.com/doi/abs/10.1108/978-1-78714-315-920161006

[7] Bos-Nehles A and Van Riemsdijk M 2014 *Human Resource Management, Social Innovation and Technology* **14** 101–133

[8] Pulyaeva V N 2018 *Digital economy and industry 4.0: new challenges* 64–8

[9] Tsygalov Yu M and Pulyaeva V N 2014 *Management science* **2** 42–6

[10] HR market does not believe in SaaS, https://rarus.ru/press/publications/135776/

[11] HR-services in Russia: market review, http://rb.ru/story/HR-tech-present/

[12] *Formation of digital economy and industry: new challenges* 2018 (St. Petersburg: Politechnical University publishing house) 660

[13] Automation in human resources management: market review, http://www.hr-portal.ru/article/sredstva-avtomatizacii-kadrovoy-deyatelnosti-obzor-rynka

[14] Pulyaeva V N 2018 *Human resources management in knowledge economy* (Moscow: SMU Publishing house) 159

[15]   Aiming for Strategic e-HRM: Motives and Consequences of e-HRM Implementation in an
        MNC, https://www.emeraldinsight.com/doi/abs/10.1108/978-1-78714-315-920161007

[16]   Bondarouk T, Marsman E and Rekers M 2014 *Human Resource Management, Social
        Innovation and Technology* **14** 179–215

[17]   Schuler R S 2013 *Journal of Chinese Human Resource Management* **4** (2) 121–127

[18]   What about Agency in e-HRM Research?,   https://www.emeraldinsight.com/doi/abs10.1108/
        978-1-78714-315-920161010?fullSc=1

[19]   Obeidat S M 2017 *Evidence-based HRM: a Global Forum for Empirical Scholarship* **5** (2) 222–
        41

[20]   Voermans M and van Veldhoven M 2007 *Personnel Review* **36** (6) 887–902