# Use of human resources information system in agricultural companies in the Czech Republic

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**Abstract:** High-quality information systems explicitly focused on working with people help companies meet the increasingly complex requirements for registration of attendance, forms, employment contracts, and much more. The article's main goal is to identify areas of human resources management for which agricultural companies in the Czech Republic use information systems to increase the efficiency of processes and evaluate the development of their usage with regard to the support of digitisation. The data, which were subjected to factor analysis, were obtained via a questionnaire survey from selected 70 agricultural companies in the Czech Republic and via qualitative research (focus group, $n = 7$). The largest share of monitored agricultural holdings is using IT systems in the area of personal data, while the smallest share of monitored agricultural holdings is using software for monitoring education and knowledge transfer. Factor analysis identified 4 factors that characterise agricultural companies according to the use of information and communication technologies (ICT) in human resource management. The results show that in terms of the current shift of the entire agriculture towards digitisation, the use of ICT in staff management of companies cannot be neglected. The outbreak of the COVID-19 pandemic exacerbates the use of ICT.

**Keywords:** digitisation in human resources; employee development; employee training; human resources information system; registration of personal data

Currently, the impact of the information and communication technologies (ICT) sector is growing, and not only on the business economy (Doucek 2010). ICT has changed the whole society, businesses, individuals dramatically and continues changing them. The OECD report (OECD 2004) on ICT, E-Business and SMEs (small and medium enterprises) confirm that information and communication technologies and the Internet are widespread in companies of all sizes and sectors, including agriculture, which is perceived as a traditional sector. The development of digital innovation in agriculture until 2020 is one of the EU strategy's main goals, and this area also includes digitisation in staffing work. There are many experts who confirm and emphasise the potential of software in the development of human resource management (Groe et al. 1996; Gunther et al. 2005; Schramm 2006; Fink 2010; Douthit and Mondore 2014; Nagendra and Deshpande 2014). A study by Nagendra and Deshpande (2014) states that using ICT in the areas of working with people human resources (HR) leads to increased effectiveness of the company.

Current emphasis on digitisation and use of ICT in all sectors, including agriculture, follows modern management trends, emphasising the development of organi-

sational and social capital with a focus on setting up processes, including staff processes also covering the evaluation of economic demands and identification of the resulting values including key metrics (profit, costs, return on investments) and dependent metrics (outsourcing and costs, fluctuation costs and recruitment costs). To a greater or lesser extent, each of the areas of human resource management is supported by ICT (Boudreau and Jesuthasan 2011; Nagendra and Deshpande 2014; Ogriseg 2017). Automated systems can collect, store, process, present and transmit data from which information can be conveyed to its users. It should be emphasised that the term "HR information system" does not mean only a computer system, but a comprehensive and strategic view of personnel information (Piabuo et al. 2017; Tambe et al. 2019). By suitable usage of ICT in business processes in every sector, these processes can be made more efficient, even without reducing personal communication or preventing new creative thinking of employees. For most companies, it was essential to ensure greater process flexibility in the context of the COVID-19 pandemic (Alabbadi and Al-Masaeed 2020). Managers must be aware of the value of employees for the company and of the need to use them in the efficiently established processes to which ICT can contribute, regardless of the industry. Within ICT, it is a developing concept of a strategic approach to personnel work, its close connection with the organisation's strategies, and last but not least, the emphasis on the development of human resources and its importance for the flexibility of the organisation (Piabuo et al. 2017). Thanks to ICT, the required information about employees will be centralised, comprehensive, and quickly available with personal data protection.

The paper's main goal is to identify areas of human resources management for which agricultural companies in the Czech Republic use information systems to increase the efficiency of processes and evaluate the development of their usage with regard to the support of digitisation.

**Theoretical background.** HR departments have an indispensable role in the free flow of knowledge to ensure the fulfilment of the organisational goals (Soliman and Spooner 2000). Successful implementation of new technologies depends, among other things, on the efficiency of the established activities in the HR department (Soliman and Spooner 2000). HR professionals must learn to work with large volumes of data (Mortensen et al. 2015; Angrave et al. 2016; Stachová et al. 2020), which can reduce the costs (Saleem 2011).

Comprehensive HR management must always be in accordance with applicable legislation and assist in setting up and managing the following areas primarily:
– Staff administration – attendance system, shift planning, medical examinations, planning and recording performance (Angrave et al. 2016), the establishment of organisational hierarchy (superiority and subordination), work flexibility settings (flexible working modes and home-office) (Belzunegui-Eraso and Erro-Garces 2020);
– Remuneration and employee benefits – staff evaluation, payroll processing (Nagendra and Deshpande 2014), employee benefits (Schramm 2006), monitoring of staff events, education, business trips, vacation planning;
– Human resource planning, employee recruitment and selection – recruitment, calls for applications (Schramm 2006; Nagendra and Deshpande 2014), building the employer brand;
– Employee education and development, career management – training (Schramm 2006), development (Schramm 2006; Nagendra and Deshpande 2014), productivity (Schramm 2006), search for and development of talents (Boudreau and Jesuthasan 2011), occupational health and safety training, succession plans, and more.

Nagendra and Deshpande (2014) divide these categories into simple (payroll records and accounting) and sophisticated (development, education, knowledge transfer, employee evaluation).

The basic pillar of any HR management system is that of keeping employee records and other operational information such as employment contracts. The main benefits include monitoring important deadlines, keeping track of all information about the employee as related to his/her activities (entry card, entrusted items, keys), keeping track of soft performance data (Angrave et al. 2016), keeping track of employment contracts, keeping track of HR agendas in one environment, keeping track of job candidates, employment launches as well as employment terminations (Schramm 2006).

Implementation of information systems in a company is definitely influenced by a number of factors such as the company size, the regional setting and, last but not least, the company focus. Due to the sensitivity of information (Angrave et al. 2016), security and data protection must be ensured, and all information must be secured. Security is also important in terms of the fact that the company systems are connected to the surrounding systems (Nagendra and Deshpande 2014). These can be both internal (attendance system, catering system)

and external (interconnection with health insurance companies, financial institutions, social security administration, financial authorities and pension companies).

In connection with the complexity of systems, their acquisition costs, lack of support from top management, HR knowledge (Nagendra and Deshpande 2014), and with duplication of some functions (Angrave et al. 2016), companies often do not implement the staff information system as a whole but acquire some of its modules. On the other hand, Ruël et al. (2004), Schramm (2006), Nagendra and Deshpande (2014) have shown that planning through staff information systems saves both time and money (due to lower administrative demands). At present, it is possible to monitor trends that are also being promoted in the field of human resources management. These include cloud computing (Angrave et al. 2016), security requirements (Nagendra and Deshpande 2014), big data analyses (Mortensen et al. 2015), external access, mobile access to the application, user-friendliness, integration technologies (Schramm 2006), design, accuracy, effectiveness, clarity, timeliness, integrated talent management suite (Angrave et al. 2016) and simplicity (Betts 2005). These categories can be lumped into three areas – contents, time, and form. The research results suggest that ICT is also associated with certain problems, such as (Postholm 2007; Ogriseg 2017; Piabuo et al. 2017; Hijmans and Raab 2018; Tambe et al. 2019): the negative attitude of workers to information and communication technologies, ICT alone is not enough to increase organisational performance, dependence on the ability of managers to manage change, ethical and legal restrictions in the context of GDPR, the complexity of HR concept, limitations resulting from small data sets. In the area of HR, it is necessary to harmonise processes related to the following activities in accordance with the requirements of the GDPR: recruitment and hiring of employees, contractual relations with employees, processes during the duration of the employment relationship, termination of employment.

According to Angrave et al. (2016), however, the development of HR and the use of ICT primarily in agriculture is hampered by a lack of understanding of analytical thinking by HR or management. However, the need for a human resources information system (HR IS) is likely to lead to a growing trend of HR outsourcing in all sectors, according to Adler (2003), Bednarz (2005) and Schramm (2006). However, in agriculture as well it is necessary to emphasise the analysis of costs, in the COVID-19 period all the more, to determine the appropriate organisation of work and learn to make decisions based on data, including staff data. ICT can be a tool that will fulfil these functions because, for example, data obtained in Agriculture 4.0 can also be used secondarily in reporting, accounting (inventory), managerial decision-making, and human resource planning, including solutions to substitute employees in case of illness or succession.

## MATERIAL AND METHODS

Qualitative ($n = 70$) and quantitative research ($n = 7$) took place in selected agricultural companies in the Czech Republic during January–April 2020. Quantitative research was carried out through an online questionnaire survey. A probabilistic selection was made in accordance with the established statistical rules. In total, 860 e-mails to owners or management of companies in the Czech Republic were sent out (20% from primary sector, 20% from secondary sector, 60% from tertiary sector), with 70 responses returning from agricultural sector (i.e. 40.7% return rate from agricultural companies). The sample was based on the Albertina database of companies. Albertina is a unique database that contains important data of more than 3 000 000 companies registered in the Czech Republic. The questionnaire respected the ethical aspect and the anonymity of respondents. The structure of companies is in Table 1.

The results can be generalised only to this sample. The research examined whether information systems are used in the following areas: keeping track of personal data, wages, employee benefits and services, attendance registration, recruitment and selection of employees, training and development of employees, work performance management, career management, work organisation, occupational safety and health (OSH), measuring work performance.

An exploratory factor analysis was used to explain the variance of the observed variables using a smaller number of latent factor variables. Correlations of a number of manifest variables were analysed in the research and groups of variables were determined on the basis of this analysis. To meet the basic assumption for the use of factor analysis, it was necessary to test the null hypothesis that the correlation matrix of the given variables is unitary (correlation coefficients between variables are null). The null hypothesis was rejected by Bartlett's test of sphericity. In order to minimise the number of variables that have high loads with each factor in common, orthogonal rotation using the Varimax method was applied.

In the factor analysis (after the correlation analysis and principal component analysis), we used the Varimax

Table 1. Structure of selected agricultural companies in relative frequencies according to area of operation, area of business, HR department and size of the company (%)

| Size of companies | Area of operation | | | | HR department | | Area of business | |
|---|---|---|---|---|---|---|---|---|
| | international | national | regional | local | yes | no | public and state-owned | private |
| 1–9 employees | 7.14 | 10.00 | 12.86 | 2.86 | 18.56 | 14.29 | 8.57 | 24.28 |
| 10–49 employees | 8.57 | 12.86 | 15.71 | 1.43 | 12.86 | 25.71 | 5.71 | 32.86 |
| 50–249 employees | 10.00 | 15.71 | 2.86 | 0.00 | 14.29 | 14.29 | 15.72 | 12.86 |
| Total | 25.71 | 38.57 | 31.43 | 4.29 | 45.71 | 54.29 | 30.00 | 70.00 |
| Total | 100.00 | | | | 100.00 | | 100.00 | |

Source: Own survey

method and the Kaiser-Guttman rule according to Anderson (2013) where only data greater than 1 (substantial factors) were processed, and values exceeding 0.3 were considered significant. The model of factor analysis describes the observations by the Equations (1):

$$X_1 = a_{11}F_1 + a_{12}F_2 + \ldots a_{1m}F_m + U_1 + \mu_1,$$
$$X_2 = a_{21}F_1 + a_{22}F_2 + \ldots a_{2m}F_m + U_2 + \mu_2,$$
$$\ldots \tag{1}$$
$$X_p = a_{p1}F_1 + a_{p2}F_2 + \ldots a_{pm}F_m + U_p + \mu_p$$

where: $X_1, \ldots, X_p$ – observed variables; $F_1, \ldots, F_m$ – latent common factors; $a_{11}, \ldots, a_{pm}$ – factor loads; $U_1, \ldots, U_p$ – specific factors representing random deviations; $\mu_1, \ldots, \mu_p$ – constants.

The statistical software used to evaluate the data was IBM SPSS Statistics Version 26.0.

Furthermore, qualitative research was carried out using a focus group consisting of a moderated discussion aimed at exploring attitudes and opinions in ICT in HR. The reference group for the focus group was deliberately chosen (owners of agricultural companies, directors, economists in an agricultural company); the size of the group was 7 participants plus a moderator. The topic of the use of ICT in HR activities in agricultural companies was discussed, in the following focus group phases: introduction and opening remarks, main part, conclusion. The focus group method was implemented after data evaluation, and the results and conclusions obtained were discussed. With regard to their recommendations, a discussion of practical recommendations was also added.

## RESULTS

ICT is one of the fastest-growing industries, and its impact on HR management related processes can be in-

creasingly witnessed. Each employee is an important part of each company, and therefore it is necessary to place great emphasis on staff activities, even in the traditional agricultural sector. Table 2 shows the relative frequencies of the use of individual information systems in the field of human resources management by selected agricultural companies in the Czech Republic.

As can be seen in Table 2, the largest share of the agricultural holdings used uses IT systems in the area of keeping track of personnel (any structured set of personal data accessible according to specific criteria) and wages. Keeping track of data in this context means any file or list of alphabetically or otherwise arranged sophisticated database of employees. In this respect, the GDPR regulation, which applies to the fully or par-

Table 2. Use of individual information systems in selected areas of HR work (relative frequencies, %)

| Area | Use of information system | |
|---|---|---|
| | yes | no |
| Keeping track of personal data | 62.86 | 37.14 |
| Wages | 58.57 | 41.43 |
| Employee benefits and services | 40.00 | 60.00 |
| Measurement of work performance | 32.86 | 67.14 |
| Attendance registration | 31.43 | 68.57 |
| Career management | 30.00 | 70.00 |
| Organisation of work | 28.57 | 71.43 |
| Recruitment and selection of employees | 25.71 | 74.29 |
| Management of work performance | 21.43 | 78.57 |
| Occupational safety and health (OSH) | 20.00 | 80.00 |
| Employee education and development | 18.57 | 81.43 |

Source: Own survey

tially automated processing of personal data and the non-automated processing of personal data that is contained or entered in a register, must be respected. In addition to mandatory items such as name and contact (e-mail or phone), it is important also to record other important information, such as starting date of employment, age, type of employment contract, job position, and more. Wage processing using IT systems helps the company process monthly wages of employees and related activities (meeting obligations with respect to state authorities, issuing certificates, providing information to other parts of the company, and more).

On the contrary, the smallest share of the monitored agricultural holdings uses software for monitoring education and knowledge transfer and circumstances related to occupational safety and health. Especially in large companies, processes associated with the administration of training are rather demanding (larger number of employees, considerable amount of training). We are talking about keeping track of information and news in corporate education and about a corporate portal where employees can view them under their own access accounts and anywhere and see their possibilities of education and completed courses. This system allows for convening individual training, printing certificates, assigning employees to relevant training, and recording which trainings the employee should complete or has already completed. Together with the "tests" module, it enables the setting up of an efficient system of internal education of employees in companies. The above represents a considerable amount of information, so it is essential for the development of HR management to systematically record this valuable data and store it comprehensively. Individual job positions can be grouped together, as certain job positions need to complete the same lists of trainings. It is inevitable to use a notification generator, drawing attention to the need to train specific employees.

The obtained results were further processed via multivariate statistics, and the Varimax method was used in the factor rotation (Table 3). The factor analysis identified 4 significant factors combining the analysed.

The first factor has a strength of approximately 25%, the second approximately 18%, the third 11% and the fourth factor has a strength of approximately 10%. Table 4 shows the factor analysis results in detail; the higher the correlation, the more the factor is saturated with this variable.

Each variable (10 variables in total) is, in Table 4, described by factor weights, namely by the correlation value of the item. As mentioned above, the factor analysis has revealed four statistically significant factors in total, which together explain a total of about 65% of the resulting behaviour of the sample.

The first factor identified (Staff Statistics) is related to the large number of processes taking place in the company and the need for regular statistical evaluation using at least elementary statistical methods. Coherence with legislation is also crucial – software must be flexible enough to respond to changes in key legislative measures. Cooperation in changes in legislation (especially in the Labor Code) must be defined in the contract between the company and the software supplier. Nagendra and Deshpande (2014) state that the necessary functions need to be carefully planned with the supplier and then required in order to avoid incompatible infrastructure and higher upgrade costs. In addition, the company can specify other requirements – multilingualism in the case of international companies and corporate style (requirements for uniform design). In the case of the first factor, the record of employee benefits and services and wages are the dominant variables. The second factor identified (Emphasis on Performance) is related to the employee performance evaluation process. The individuality of employees must be considered in a much broader context than just as a productive factor in managerial plans and considerations. This includes all materials related to the compilation of evaluation forms, selection of evaluation scales and processing of results into the final report. Employee evaluation is a process the main goal of which is to improve work performance based on the constant development of skills and overall competence of employees, as well as their appropriate work be-

Table 3. Resultant factors (according to the Varimax method)

| Factor | Total variance | Total % of variance | Cumulative % of variance |
|---|---|---|---|
| Factor 1 (Staff Statistics) | 2.788 | 25.349 | 25.349 |
| Factor 2 (Emphasis on Performance) | 2.008 | 18.253 | 43.602 |
| Factor 3 (Competence Development) | 1.241 | 11.279 | 54.881 |
| Factor 4 (Ensuring Continuity) | 1.098 | 9.980 | 64.861 |

Source: Own survey

Table 4. Resultant factors by the Varimax method, demonstrable using the information and communication technologies (ICT) in agricultural companies

| Variables | Factor 1 (Staff Statistics) | Factor 2 (Emphasis on Performance) | Factor 3 (Competence Development) | Factor 4 (Ensuring Continuity) |
|---|---|---|---|---|
| Keeping track of personal data | 0.553 | –0.421 | 0.381 | –0.088 |
| Wages | 0.706 | –0.014 | –0.315 | –0.224 |
| Employee benefits and services | 0.756 | –0.067 | 0.236 | 0.208 |
| Attendance registration | 0.570 | 0.362 | –0.002 | –0.050 |
| Recruitment and selection of employees | 0.045 | 0.459 | 0.623 | –0.192 |
| Employee education and development | 0.586 | 0.070 | 0.425 | 0.024 |
| Management of work performance | 0.142 | 0.794 | 0.285 | 0.024 |
| Career management | 0.233 | 0.205 | 0.115 | 0.780 |
| Organization of work | 0.073 | 0.010 | 0.817 | 0.114 |
| Occupational safety and health (OSH) | 0.438 | 0.056 | 0.114 | –0.689 |
| Measurement of work performance | –0.059 | 0.837 | –0.049 | 0.160 |
| Total % of variance | 25.349 | 18.253 | 11.279 | 9.980 |

Source: Own survey

haviour. A proper performance evaluation system can also help in meeting this goal. The dominant variable, in this case, is the measurement of work performance. Cooperation with the line manager of a specific department is essential, and in order to make the evaluation implementable, it is necessary to inform the employees concerned who will act as evaluators in the evaluation. The employee evaluation must be recorded and saved so that it can be returned at any time in the future.

The third factor identified is Competence Development as the ability to use knowledge and skills to achieve the intended results. In a broader sense, competence is also understood as a power. The dominant variable for this factor is the organisation of work. The company determines the necessary competencies of persons performing work, influencing compliance with the requirements. The company should have staff that have the necessary competencies to carry out the specified activities. The analysis of competencies concerns the workplace's expected performance and the worker's behaviour at the workplace in relation to the requirements at the given workplace. The competence level can be linked to a 360-degree feedback system (performance evaluation). The last factor identified is Ensuring Continuity with career management as the dominant variable, which is one of the important motivating factors for employees. The traditional attitude to career prefers a continuous process culminating in the achievement of a certain managerial function. The main characteristic of the module dealing with career planning and management is search for suitable jobs for prospective employees, search for suitable employees for a certain job, linking job positions, compiling a succession plan, creating a personal development plan.

The importance of the use of ICT in agriculture, primarily in HR activities [employee benefits (0.756), wages (0.706), attendance registration (0.570) and keeping track of personal data (0.553)] was also confirmed in the focus group. The participants agreed that in agriculture, it is crucial to provide enough employees, even without qualifications, to ensure the harvest and overall smooth operation of the company. Regarding the shortage of labour in agriculture, even the Emphasis on Performance is a secondary criterion; primarily, the focus is on the provision of a sufficient number of workers from home or abroad and the outflow of foreign workers due to COVID-19. Only after having ensured the "HR statistics" (identified factor) and smooth operation, the company can focus on the education and development of its employees, including sharing knowledge between generations of employees or the general public.

## DISCUSSION

The primary purpose of HR IS is to improve human resource management processes and operations by facilitating and accelerating access to and understanding of key data about employees and core processes (Angrave et al. 2016); this is supported by Stachová et al. (2020) and in line with the conclusions of the present article. It is possible to agree with the conclusions of Nagendra and Deshpande (2014) or Angrave et al. (2016) that in practice, the HR professionals very often do not understand the analytics while conversely, the analysts do not understand HR, resulting in very expensive programs, not used to their full potential by HR specialists. For this reason, the need for simplicity remains a key driver in the development of HR technologies, in line with the conclusions of Betts (2005) or Schramm (2006). Their research found that a company that did not reduce the complexity of its IT systems spent approximately 30% more on financial operations and 18% more on HR functions. Of all the HR IS subsystems, Nagendra and Deshpande (2014) rate recruitment, training, planning, and development in all sectors as the most useful. However, based on the results achieved in agricultural companies, the most important is the use of ICT in keeping track of personal data, wages, employee benefits, and attendance registration. Next is the work performance, and only after that recruitment, selection, training, planning, and development. There is a difference when compared to other sectors related to specific conditions in agriculture (seasonality, labour intensity).

Concerning the above, it is necessary to use ICT effectively and realise that their use strongly affects the management of human resources, as the efficiency of the entire agricultural company or farm inextricably includes staffing which is in line with research Piabuo et al. (2017). However, the use of ICT must be in line with the established corporate strategy, which is also emphasised by Nagendra and Deshpande (2014). However, HR management remains and will always be one of the strategic dominants and priorities. The issues of methods, timing, and priorities of the programs, and how the human resources plans and programs will be provided in the company must always be decided by the responsible employees in the management and in the area of human resources.

In accordance with Angrave et al. (2016) and Giampietri and Trestini (2020), when using ICT in HR activities, the decision to retain or outsource them is also important, including the emphasis on quality, availability of information, finances, and cost rationality. These present the possibilities of competitive advantage on the labour and employment market in all sectors, including agriculture.

In summary, innovation (development of IS in terms of new strategic needs and technical possibilities), digitisation (new possibilities of communication and data collection) is a priority in the 21$^{st}$ century (Pacana et al. 2020), even in the traditional sector of agriculture. These areas are an integral part of research priorities in the field of new technologies and circular economy within the bioeconomy. Agricultural companies will increasingly focus on digitisation and use of ICT but must not neglect the area of human resources. This area has been and always will be a priority because agriculture cannot operate without people. Everything is evidenced by the current COVID-19 situation (Alabbadi and Al-Masaeed 2020) when agricultural companies do not have enough workers to harvest their products (Jámbor et al. 2020). It is all the more necessary to streamline HR management processes, and the use of ICT in this area is an opportunity to achieve this.

## CONCLUSION

The research showed that in terms of working with employees, ICT is used in the surveyed agricultural companies primarily to keep track of personal data, wages, employee benefits, and attendance registration. Furthermore, four key factors were identified – Staff Statistics (with the dominant variable employee benefits and services), Emphasis on Performance (dominant variable measurement of work performance), Competence Development (dominant variable organisation of work), Ensuring Continuity (dominant variable career management). The largest share of monitored agricultural holdings is using IT systems in the area of personal data, while the smallest share of monitored agricultural holdings is using software for monitoring education and knowledge transfer and OSH training.

The practical benefit of the article is the presentation of the current use of ICT in selected agricultural companies within the HR activities and presenting the companies with an overview of areas of HR activities for which it is appropriate to use ICT. The limit of the article is the rather low number of surveyed agricultural companies; however, with regard to the number of those in the Czech Republic, this sample is sufficient, and the results were also supplemented by the conclusions of qualitative research with agriculture experts. Therefore, the observations should be interpreted in the context of the presented research sample and generalised for the given

sample as the reviewers might tend to create a better image of their organisations and wanted to be more rational.

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