

Personnel controlling tools in the era of industry 4.0

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Abstract. The aim of this paper is to contribute to the discussion of personnel controlling tools and changes that occur as a result of Industry 4.0 through a literature search. We have used basic scientific methods, such as analysis, synthesis, generalization, comparison, induction and deduction, to develop a literature search. By studying the topic, we performed an analysis of current knowledge about selected personnel controlling tools and changes in the Industry 4.0 era. Schulte (2020) considers strategic planning of the workforce and requirements, employee surveys, balanced scorecard, benchmarking and process model of personnel analytics to be selected tools of personnel controlling. We also identified changes that occur in the researched topic in the context of Industry 4.0 era. These changes are the increasing digitization of individual tools due to the increase not only in the volume of data being processed, but also in the speed at which the data is processed. It uses analytics that include methods for the highest degree of automation of recognition and the use of patterns, contexts and meanings. Statistical methods, predictive models, optimization algorithms, data mining, text and image analysis are also used. Innovative solutions for virtual environments are transforming people management tools by automating manual processes and optimizing the implementation of strategic tasks. It is in the interest of companies to adapt to change to remain competitive.

Keywords: personnel controlling, tools, industry 4.0

JEL classification: M19, M50

1 Introduction

Since about 1990, personnel controlling has been an important part of strategic human resource management, providing a wide scope for research. Personnel controlling is often identified with monitoring in terms of supervision or control, but this does not

capture the idea and interest in controlling. Controlling is a management concept and therefore has a much wider scope. Research in this area is becoming increasingly important as the company's success is increasingly focused on personnel, especially in industries that are personnel intensive (Preitler, 2012). In the global world, revolutionary changes are taking place in the field of technology and technologies based on the use of information and communication technologies. Human capital plays a key role in all these processes as the creator of these changes, but also as an actor on the side of their use and improvement. Digitization changes people management, both in terms of value and methodology. The content of performance and the path to performance are changing. Tools and techniques for obtaining performance information need to be adapted. One of these topics is personnel controlling, which is used to analyze personnel data. It primarily focuses on trend analysis and strategic personnel planning, but also on the early recognition of deficiencies in various areas, as well as on personnel development, performance management, employee retention and performance stimulation.

With advancing technologies, personnel controlling must develop tools to assess the impact of personnel work on profit. However, this does not only mean exercising control over this activity from a purely economic point of view. Personnel controlling can be performed effectively if the personnel controller has knowledge of quantitative accounting systems as well as qualitative behavioral effects and can combine both.

Unlike traditional personnel controlling, where the main function of controllers was to pay salaries, control working hours and basically manual and bureaucratic activities, personnel controlling 4.0 focuses on efficiency in a broader context, on areas such as attracting qualified talent, planning necessary employee competencies, performance management in line with the company's strategy and employee interests, as well as improving the organizational climate and other approaches that directly contribute to the company's strategic results. Personnel controlling 4.0 is permeated by technology and is in line with new labor market scenarios. The trend of people orientation and humanization of work is becoming a reality. Organizations use IT support to automate repetitive, uncreative, and unattractive work.

Perhaps the most important influence that distinguishes traditional personnel controlling from personnel controlling 4.0 is the so-called digital transformation. Companies today have a greater tendency to adopt online tools and use digitized methods or techniques. Innovative virtual solutions and resources help operations both manage people and automate manual processes and optimize strategic tasks. From talent search and planning, through performance management to control itself, bureaucratic processes are performed with a minimum of human intervention, which creates more space for HR 4.0 professionals for complex analysis and strategic orientation and requires less for operational performance.

People analytics can improve the transparency of decisions, and employee development can derive performance for the future from past data and, in particular, contribute to improving employee selection and development. For example, applying comparison algorithms can improve the matching of skills to jobs or create them at all in many companies. Skills gaps analyzes may suggest the addition of skills and job requirements to employees, and path-finding algorithms may suggest individual training programs. This thematic area is based mainly on computer-assisted evaluation.

2 Research design

The aim of this paper is to contribute to the discussion of personnel controlling tools and changes that occur in personnel controlling tools in the context of Industry 4.0 through a literature search. Schulte (2020) considers strategic planning of the workforce and requirements, employee surveys, balanced scorecard, benchmarking and process model of personnel analytics to be selected tools of personnel controlling.

We used available domestic and foreign sources to analyze the topic, which describe the individual tools in more detail. We have analyzed the study published in registered databases, which deal with the content of this management concept and changes in personnel controlling due to the digital transformation of companies.

Through obtained information, we get to the theoretical processing of the topic. We have used basic scientific methods, such as analysis, synthesis, generalization, comparison, induction and deduction, to develop a literature search. By studying the topic, we performed an analysis of current knowledge about personnel controlling tools and changes in the Industry 4.0 era.

Based on the set goal, two research questions were formulated:

RQ1: What are the currently available tools for personnel controlling?

RQ2: What changes in personnel controlling tools are taking place in the context of Industry 4.0?

We answered the research questions in the following part of the theoretical research.

3 Results and discussion

Various tools are used to achieve the goals of personnel controlling. It is often possible to encounter these tools in another area of business management, because they are standard control tools that have been modified in some way and adapted to the needs of personnel management and at the same time digitally transforming times. Development challenges remain to be met in this area. Ackermann and Scholz (1991) state that a number of individual tools are known which focus on analysis, planning, management and control. However, personnel controlling needs comprehensive tools to perform its functions in order to capture all the necessary aspects.

Urban (2008) characterizes the tools of personnel controlling as the main methods used to analyze and evaluate the level and results of human resource management in the company. He divided the personnel controlling tools in accordance with the basic division into quantitative, qualitative, operational and strategic, while he considers the audit of human resources management, personnel standards, personnel indicators and employee surveys to be personnel controlling tools.

- The human resources management audit is a tool of strategic personnel controlling used to assess the objectives of human resources management, its

effectiveness, methods and longer-term results. It concerns the assessment of the compliance of personnel processes with generally applicable rules (decrees, laws, regulations).

- Personnel standards are based on the company's intentions, we distinguish quantitative (defining the target values of indicators that should be achieved) and qualitative (characterizing the rules or principles of human resource management.)
- Personnel indicators are aggregates, usually relative, that express the proportion or relationship between several variables. They monitor the quantitative results of human resource management and are more operational. However, to some extent they reflect strategic aspects and can provide an idea of the quality of human resource management.
- Employee survey is a tool used to evaluate the qualitative characteristics of employees, e.g. skills, motivation, satisfaction, loyalty, etc.

The previously outlined tools of personnel controlling have been mentioned based on the author's clear and practice-oriented approach to the subject. Some of the early concepts are still relevant today and have been the pillars of building new tools for the modern concept. In the further context of this paper, we identify and characterize personnel controlling tools that are increasingly coming to the fore in digitally transforming companies under the influence of the 4.0 era, based on a publication by Schulte (2020):

Strategic workforce planning and requirements

The aim of the strategic workforce management concept is to comprehensively assess strategic options from a staffing perspective and to ensure at an early stage that corporate plans can be implemented with the necessary competencies. This requires an accurate knowledge of market drivers, competition and technology. The requirements for the human resources department are the need for qualitative orientation, the creation of a long-term perspective as well as the ability to create scenarios (Sattelberger and Strack, 2009).

- Qualitative orientation: a key contribution of the human resources department in the context of the strategy discussions must be the clear identification and analysis of the key competencies that will be needed in the future.
- Creating a long-term perspective: a sufficiently long planning period is needed to take full account of the effects of strategic options or plans.
- Ability to create scenarios: Due to the high degree of uncertainty in strategic planning, several scenarios are often analyzed depending on the defined influencing variables. In order to discuss potential personnel effects and requirements, a flexible simulation option with parameter support is very useful.

The concept of strategic workforce planning can be implemented in the following five steps (Sattelberger and Strack 2009):

- I. Strategy-based segmentation - the first step is to create a meaningful system of grouping jobs. This system should explicitly map expected changes in skills from a strategic point of view, for example by introducing a technological, product or market dimension into the definition of the required group. In order to be able to derive specific measures from the subsequent analysis of deficiencies, it must be possible to deal specifically with the stocks of employees recorded in the various groups.
- II. Inventory simulation. In this case, it is a workforce forecast that assumes different scenarios (e.g. no staffing measures, different retirement scenarios). This analysis provides information on where unbalanced age structures will lead to a lack of the company's own personnel capacity in the future.
- III. Demand modeling. In the third step, personnel requirements for individual work groups will be determined using driving force models that illustrate the long-term development of business and productivity, as well as sensitivity and scenarios.
- IV. Analysis of differences. The results of the inventory and demand simulation are reflected in a gap analysis, which shows the difference between staff demand and inventory for each job group during the planning period.
- V. Derivation of personnel measures. In order to compensate for overcapacity and undercapacity, options can in principle be considered, such as: qualification of staff, redeployment of staff from surplus to shortage areas, implementation of training, recruitment, training and further training, etc.

Employee survey

Employee surveys have been used with great success as a strategic management tool for more than 40 years. It offers the possibility of direct survey among employees. As synonymous terms we can consider e.g. corporate climate analysis, employee satisfaction analysis, employee feedback, etc.

Employee surveys use four target groups: for employees it is a tool for targeted improvement of working conditions, for management it is a tool for strategic control in performance management, measurement tools for analyzing corporate culture and for managers it is a tool for development (Mönninghoff, 2013). As part of the employee survey, employees can report complaints anonymously, but also state what they are very satisfied with. Based on the results, the needs for improvement and successes will be transparently identified. Ideally, subsequent team-level processes give employees the opportunity to actively help develop their immediate work environment. If the results of the survey are actively discussed in the dialogue between management, managers, employees and works councils, this process is an essential component of a

participatory management style. In this way, employees can regularly critically examine work processes, working conditions and information flows and optimize them in a targeted manner.

Balanced Scorecard

The Balanced Scorecard method was developed in the early 1990s as part of a research project led by Robert S. Kaplan and David P. Norton. The authors describe their system of indicators as "balanced" because the company's performance is planned and controlled from four different perspectives (Kaplan and Norton, 1992).

- Financial perspective: key financial data provide information on whether the implementation of the strategy leads to improved financial results. Typical key financial data are the return on investment and the development of the company's value.
- Customer perspective: the task of the customer perspective is to present the company's strategic goals with respect to the customer and the market segments being worked on. Key data, objectives and measures should be developed for the identified customer and market segments.
- Internal processes perspective: within the perspective of internal processes, processes are mapped that have a significant impact on the achievement of financial and customer goals. Typical key figures are delivery times, quality or productivity.
- Learning and Growth Perspective: The fourth and final perspective of the Balanced Scorecard includes goals and indicators to support learning and organizational development. The education and growth perspective describes the infrastructure needed to achieve the three perspectives mentioned above, but also to emphasize the need to invest in the future.

In order to take into account the peculiarities of personnel management, the perspectives proposed by Kaplan and Norton can be modified as follows (Tonnesen, 2000):

- Profitability perspective = measuring the contribution of personnel work to financial success or economic performance. Specifically, we can include, for example, added value (per employee) or cash flow (per employee), personnel costs, key productivity data (per employee or per team), etc.
- Employee perspective that takes into account the work and management situation as a key factor influencing employee satisfaction. These include: key data on employee satisfaction (indices), absenteeism rate, turnover rate, women's quota, average age, part-time rate, hierarchy and team structures, etc.
- A quality perspective that is used to measure quality in the personnel area. These are, for example, target deviations from reality, error rate, number of complaints, success rate, number of solved problems, etc.
- A perspective of knowledge and learning that takes into account the foundations of the future development of society. We can include here, for example: days of training per employee, the number of proposals for

improvement, their rate of implementation and the corresponding value, expenditure on further education, etc.

Benchmarking

Benchmarking is an objective comparative assessment of business structures, processes, costs and technologies based on indicators that are the result of direct analysis of data and information from a company, competing companies or companies in another sector (Berens, 1997). The aim of benchmarking is to learn from the procedures and processes used by the best practices, so that it is possible to subsequently transfer or directly "copy" best practices in a modified form suitable for own company. The best values obtained during the analysis are referred to as reference values, the difference between the baseline situation and the reference value as a gap. After an in-depth analysis and comparison of the process with one or more "partners", it is necessary to close this gap by taking appropriate measures. Adopting best practices often also means breaking paradigms. This must be followed by continuous improvement of one's own processes (Sänger, 1996).

Benchmarking is characterized by the following main features (Berens, 1997):

- **Process orientation:** part of benchmarking is the need to identify, define, quantify, compare and improve operational processes using relevant measured variables.
- **Continuity:** benchmarking should not be done on a one-off basis, but should be a continuous process of self-renewal and improvement.
- **Partnership:** without a willingness to provide information and openness on the part of all stakeholders (whether internal or external), the benefits of benchmarking are limited, if not completely questioned. The comparison units should be considered as partners exchanging information on common processes in the framework of the cooperation.
- **Actions:** the meaningfulness of the results and their acceptance depends to a large extent on the definition of appropriate actions and their uniform recording for all key activities.
- **Holistic approach:** benchmarking can be used in all areas of the company. The object of consideration should not be the isolated individual functions, but the whole sequence of related activities.

The main subject of personnel benchmarking is the comparison of personnel functions or personnel department as an organizational unit, as well as specific personnel processes. When comparing the personnel function, structural data are determined, which represent the size and design of the personnel department. On this basis, it is possible to develop key data against which the human resources departments of different companies can be compared (eg the number of employees in the human resources department per 100 employees). In order to compare HR processes, data on processes such as recruitment or payroll accounting is collected. The goals that the company pursues when using this tool can be e.g. reducing costs in the human resources

department, speeding up processes or improving the quality of employees' work results. Urban (2008) considers the following to be the most common areas of comparison in the field of human resources:

- productivity and added value
- salaries and employee benefits,
- absences and fluctuations,
- recruitment and employee selection,
- training and development of employees,
- workforce structure.

Internal benchmarking involves comparisons between companies to identify internal "best practices", e.g. divisions, personnel departments, etc. Thanks to direct access to big data through various cloud solutions, data collection in this case is relatively simple and results can be achieved in a relatively short time. In contrast, external benchmarking involves all forms of comparison with other companies. It can be direct competitors, other companies from the same sector or companies from other sectors.

Process model of people analytics

Due to the growing digitization of the entire value chain, not only the volume of processed data is growing exponentially, but also the speed at which data are processed. In addition to the availability of an increasing amount of data that can be used, more powerful data analysis capabilities have been developed in recent years (advanced analytics). Real-time data processing for increasing volumes of data is made possible by advanced database technologies. This also increases the attractiveness of using multidimensional statistical methods for relationship recognition, simulation methods, and data mining methods, text, processes, the web, and media for automatic pattern recognition (Wickel-Kirsch, 2019).

Analytics includes methods for making pattern, context and meaning recognition and use as automated as possible. Statistical methods, predictive models, optimization algorithms, data mining, text and image analysis are used. As a result, previous methods of data analysis have been greatly expanded. Emphasis is placed on the speed of analysis (in real time) and at the same time ease of use, which is a decisive factor in the use of analytical methods in many areas of society. One of these areas is the area of human resources management.

People analytics, also referred to as HR analytics or workforce analytics or talent analytics, involves the collection, analysis and reporting of a variety of HR data. It enables businesses to measure the impact of a range of HR metrics on overall business performance and make data-driven decisions. In other words, HR analytics is a big data approach to human resource management. It is a relatively new tool, so it is still largely unexplored in the research literature. The most well-known definition of scientific HR analytics is from Heuvel and Bondarouk. According to them, HR analytics is the systematic identification and quantification of people who are the driving force of business results (Heuvel and Bondarouk, 2016). It involves the interconnection and use of multiple company and personal data based on IT-supported data analysis. The central

goal is to make human resources decisions more analytical and fact-based, i.e. decision-making based on knowledge (evidence-based human resource management). The process model of HR analytics can be used to implement this tool, which assumes three phases (Reindl and Krügl, 2017):

- I. Qualitative phase:
 1. specifically define the problem (as simple and specific as possible, preferably in one sentence; without anticipating a solution, if possible, formulate it as an open question or topic),
 2. gather information and understand the overall context (the goal is to identify the factors that affect or are related to the problem),
 3. develop specific testable hypotheses.

- II. Quantitative phase:
 4. developing own research proposal. Creating a database for analysis. It includes these sub-steps:
 - a) developing an understanding of data (exploring available data, data types and data sources),
 - b) defining data protection rules,
 - c) data collection,
 - d) data preparation and data quality control,
 - e) selection of appropriate analysis procedures,
 - f) testing the analysis procedure on a manageable data set.
 5. Data analysis with the whole data set and evaluation of the quality of the results. The analysis either refutes or confirms the hypotheses developed in step 3. Using the findings from steps 2 and 3, the results of the analysis are then interpreted in the context of corporate reality (are the results meaningful? If not, which results are particularly surprising? How can they be explained? What do these results mean for everyday work?)

- III. Implementation phase:
 6. Visualization - test results should be presented in simple, clear reports to be as clear and comprehensible as possible.
 7. Implementation in the company by drawing up recommendations for actions that form the basis for the company's change processes.
 8. Evaluation of the results of the implementation project in order to gain knowledge for future analytical projects of people.

4 Conclusion

Through the study of domestic and foreign professional literature on personnel controlling as a management concept, we have currently provided answers to established research questions. First of all, we have defined currently available personnel controlling tools, which can include strategic planning of the workforce and

requirements, employee surveys, balanced scorecard, benchmarking or process model of people analytics. We also identified what changes in personnel controlling tools are taking place in the context of Industry 4.0. These changes are the growing digitization of individual tools due to the increase not only in the volume of processed data, but also in the speed at which the data is processed. It uses analytics that include methods for the highest degree of automation of recognition and the use of patterns, contexts and meanings. Statistical methods, prediction models, optimization algorithms, data mining, text and image analysis are also used. Innovative solutions for virtual environments are transforming people management tools by automating manual processes and optimizing the implementation of strategic tasks. From talent search and planning, through performance management to control itself, bureaucratic processes are performed with a minimum of human intervention, which creates more space for HR 4.0 professionals for complex analysis and strategic orientation and requires less for operational performance.

Today, companies are more likely to implement online tools and use the digital environment for performance. There is a value transformation, which brings new methods, tools and a new essence of value-creating activities of companies. Thus, there are also changes in the tools for measuring the new nature of performance. The COVID-19 pandemic has limited the number of companies in their traditional operation in the physical space, and many have been forced to digitize and automate operations and processes that are not necessarily performed by humans, but also use various online platforms, etc.

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