

# Adoption of Human Resource Development Management Model for Group Planning

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**Abstract:** The human resources development management model that has been developed in previous stage of the research allows to create information systems with functionality to automatize the human resources development planning process. The author researched the model's use cases and identified grope factors that influence development planning. The present article describes two approaches to extend the model in order to provide development planning in groups. Post-planning optimization approach is based on linear optimisation methods and allows to preserve the full individualisation of development plans by combining employees in groups with the same solutions in development plans. In this way, the group interests are not realized in full scale in order to maintain full individualisation. Pre-planning optimisation is based on competence gap analyses and provides better grouping with less individualisation. Both methods should be implemented in a real system for better suitability.

## 1 INTRODUCTION

Effective human resources management consists of several processes related to planning of development of human resources. The key goal of these processes is to create employees' development plan (DP) that have to ensure employees' development up to a certain level as regards competences and therefore ensure also employees' ability to reach the set working goals, tasks and results in the specific environment of an organisation. However, effective planning of employees' development is a complex process that requires considering companies' process environment.

Applying competence-based human resources management, during the study a model was established in line with the defined framework of the study (Kazakovs, 2013) that ensures planning of employees' development, which in its essence is seeking and selections of the development solutions (DS) individually most suitable for an employee in line with the individual development needs (Kazakovs et al., 2015). The model allow to automate the planning process by analysing and selecting best DS for every employee partially or entirely automatic.

Though, some HR management information systems offer employees' development planning

functionality, it's limited to manual planning and includes no automation.

However, the developed model does not ensure support of implementation process of these plans. During the study, analysing model verification data and studying application approaches, a necessity was identified to supplement the model to ensure its application to planning of development of the group of employees in line with the requirements of the model application environment. The issues regarding planning of development of the group of employees arose when creating individual employees' development plans it is necessary to ensure interaction of two or more development plans and ability to implement those considering company's strategic view on employees' development. A situation forms in which the maximum number of plans is not limited.

The goal of this study is to improve the human resources development management model (HRDMM) to ensure development planning of the group of employees on the basis of the group's factors.

The following objectives were set to achieve the goal:

- To identify the group's factors that influence development planning;
- To develop approaches to optimize HRDMM planning results for implementation in gropes;

- To verify whether the supplemented model works in the real business situations.

## 2 APPLICATION ENVIRONMENT FOR HRDMM

During the previous study activities, human resources (HR) management experts recognised that implementation of development activities in groups helps to save resources, especially financial and time resources (Jenkins, 2015). This refers to DS for full-time study forms – courses, seminars, lectures etc. Therefore, it was decided to seek for opportunities to supplement HRDMM to ensure development planning based on the group's interests.

Development planning for the group of employees, in line with HRDMM, is development planning for each employee individually based on the group's interests, which is manifested as requirements and limitations set for the development process. These requirements and limitations can be complied with by introducing changes in the individual development plan or planning implementation of development plans appropriately. To understand how the set requirement can be complied with, the following questions have to be answered:

- Would the change of the selected DS facilitate compliance with the requirements?
- Can the requirements be complied without changing employees' development plans but changing logistics of the DS?

As a result, there are cases when requirements can be complied with by changing plans and implementation logistics. In these cases, the representative of a company responsible for planning of employees' development has to decide on the further action.

To clarify possible application scenarios of the model under development and supplement the model in a way it can be applied to as many business situations as possible and provide support for business, a discussion with 10 human resources management specialists was organised within the framework of the study:

- The goal of the discussion was to clarify business situations in which HRDMM can be applied, in which planning of individual employees' development is performed considering the context of the group of employees and to identify group's factors that influence planning of employees' development;

- Hypothesis of the discussion was: to ensure compliance with company's development strategy and business interests when planning the individual development of employees, the context of the group of employees has to be considered;

- Criteria for the participants of discussion – human resources management specialists with at least three years experience in planning of employees' development in medium-sized and large companies.

After the discussion, the obtained information was summarised, content analysis was performed and conclusions were drawn. All participants of the discussion were informed on the conclusions and they were offered to provide their comments that were included in the description of the discussion.

Analysing the summarised business situations it can be concluded that when planning development of the group of employees, clients mainly chose to determine the contents of training, the length of development activities, venue and price, as well as the composition of the development groups (DG). Further research showed that these requirements can be complied with the existing version of HRDMM, however, the model has to be supplemented to ensure the possibility to influence the composition of the DG during the planning phase that will become the key function of HRDMM of group planning.

## 3 EXPANSION OF HRDMM

The group's factors identified during the study would allow organising employees' development process in a shorter period of time and therefore would require smaller amount of financial resources implementing DS in groups. To ensure this, development plans have to contain similar DS, as only in case of similar DS, employees can be united in groups and these DS can be implemented in groups. This refers to full-time development methods, for example, courses, lectures, seminars etc., however, it does not refer to development forms by correspondence, for example, e-learning, reading etc. By using development forms by correspondence, only the financial factors remain topical.

To make HRDMM applicable to development planning of the group of employees, it should be supplemented with components that would ensure development of as similar development plans as possible and in certain cases development of identical plans or development of a universal development plan, where the universal plan is the plan that ensures development of employee and reduction of

competence gaps (CG) in the amount that is acceptable by the company.

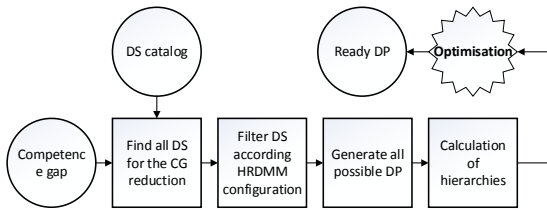


Figure 1: Expansion of HRDMM with post-planning optimisation.

During the study, two approaches were identified how to achieve similarity of the development plans. The first approach is the post-planning optimisation. Figure 1: “Expansion of HRDMM with post-planning optimisation” displays HRDMM schematically and shows in which process phase it is planned to include optimisation.

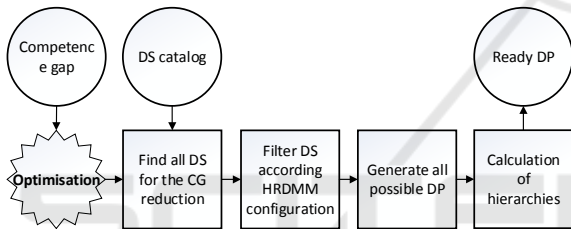


Figure 2: Expansion of HRDMM with pre-planning optimisation.

The second approach is pre-planning optimisation. Figure 2: “Expansion of HRDMM with pre-planning optimisation” displays HRDMM schematically and shows in which process phase it is planned to include optimisation.

To expand results of HRDMM with post-planning optimisation, development plans with calculated hierarchical indices  $H_n$  (Saaty, 1990) are analysed in line with the linear optimisation approach, combination of development plans is calculated, in which development plans of several employees consist of the maximum number of the same development solutions and is the maximum amount of hierarchical indices.

Graphically it has been displayed in Figure 3: “Linear optimisation of development plans”, where Emp1 – Empn – employees whose development is planned, DS1 – DSn – development solutions on the basis of which all the possible development plans have been derived, H – hierarchical index calculated on the basis of analytic hierarchy process (AHP) (Saaty, 2008). In the example, development plans have been arranged by the hierarchical index in a

Emp1	Emp2	Emp3	Emp4
H=0,50 DS1 DS2 DS3 DS4	H=0,37 DS1 DS2 DS5 DS9	H=0,41 DS11 DS21 DS12 DS14	H=0,62 DS5 DS15 DS7
H=0,40 DS5 DS6 DS7 DS4	H=0,36 DS5 DS16 DS10	H=0,38 DS5 DS8 DS19 DS41	H=0,55 DS5 DS20 DS21 DS17
H=0,35 DS8 DS3 DS4 DS9	H=0,24 DS7 DS3 DS4 DS16	H=0,15 DS24 DS3 DS14 DS19	H=0,47 DS18 DS19 DS27 DS9

Figure 3: Linear optimisation of development plans.

descending order and without optimisation group interest employees would be offered development plans with the highest hierarchical indices. However, considering the group’s interests to ensure that an employee is offered the same development solutions and the implementation process of development plans would become more efficient, another plans have to be selected when teaching several employees at the same time that have been highlighted in Figure 3 with bold lines.

Emp1	Emp2	Emp3	Emp4
H=0,50 <b>DS1</b> DS2 DS3 DS4	H=0,37 <b>DS1</b> <b>DS2</b> DS5 DS9	H=0,41 <b>DS1</b> <b>DS2</b> DS12 DS14	H=0,62 <b>DS1</b> <b>DS2</b> DS7
H=0,47 DS1 DS2 DS8 DS4	H=0,36 DS1 DS2 DS10	H=0,41 DS1 DS2 DS19 DS4	H=0,61 DS1 DS2 DS21 DS17
H=0,35 DS1 DS2 DS15 DS6	H=0,24 DS1 DS2 DS22 DS11	H=0,15 DS1 DS2 DS14 DS19	H=0,47 DS1 DS2 DS27 DS9

Figure 4: Pre-planning optimisation of development plans.

The key element of the pre-planning optimisation is analysis of employees’ competence gaps and seeking for common solutions. In the further planning process these common development solutions are introduced in the development plans as mandatory and the remaining parts of the competence gaps is processed in line with HRDMM. Figure 4: “Pre-planning optimisation of development plans” schematically displays development plans of four

employees after the analysis of CG. Development solutions DS1 and DS2 have been introduced in all development plans (highlighted using bold lines in Figure 4), the remaining parts of plans are different.

### 3.1 Post-planning Optimisation of Development Plans

The approach of post-planning optimisation is based on the linear optimisation methods. This rather simple approach allows to solve the problem of employee's development automated planning for groups, that isn't solved in HR management yet.

The goal of development plan optimisation is defined as follows – to find a combination of development plans that includes the maximum possible number of common elements (development solutions) and the amount of hierarchical indices is bigger.

Mathematically the goal of the optimisation can be defined as follows:

$$G = \{D: D \leq n\} \tag{1}$$

where “G” is the group of employees whose development is planned, D1, D2, ..., Dn – employees in the group, n – number of employee in the group;

$$DP = \sum_{j=1}^s DS_j \tag{2}$$

where “DP” is development plan, “DS” – development solution, “S” – the permissible number of development solutions in the plan.

In the first phase, all the possible combinations of development plans “C” have to be summarised. E.g. for 3 employees the possible combinations are as follows:

$$C1 = DP1 + DP1 + DP1; C2 = DP1 + DP1 + DP2; C3 = DP1 + DP1 + DP3; C4 = DP1 + DP2 + DP1;$$

.....

$$Cn = DPk + DPl + DPm, \text{ where “k”, “l”, “m” – number of development plans of each employee.}$$

The number of combinations of development plans:

$$M = kl + lm, \text{ or} \tag{3}$$

$$M = m_1 * m_2 + m_2 * m_3 + \dots + m_{n-1} * m_n \tag{4}$$

where “m” is the number of development plans for employees.

In the second phase, the number of the same DS have to be found in the combinations of development plans “C” or the number of development solutions that repeat in all elements of combination “C”.

Common elements of development plans are labelled as “CDS”, then

$$\begin{cases} CDS = DP1 \cap DP2 \cap \dots \cap DPn \\ CDS \in DP1, DP2, \dots, DPn \end{cases} \tag{5}$$

In the third phase, combination of development plans “CDP” with the highest number of the same development solutions “CDS” and the highest amount of hierarchical indices “H” must be found:

$$\begin{cases} CDS \rightarrow \max \\ \sum_{i=1}^n H_i \rightarrow \max \end{cases} \tag{6}$$

If compliance is ensured with these conditions, development plans are selected for the group of employees that ensure the maximally possible compatibility of development solutions with other participants of the group and thereby ensuring compliance with the requirements the development process can be executed in groups.

In the real conditions, such approach would give limited results as it prescribes only combinations of all employees' development plans. In other words, DS are sought that are attributed to all participants of the planning group in different DP.

Practically, to organise group trainings, the minimum number of participants is provided. This allows to find the common DS more often because they oughtn't to be attributed to all DP.

As opposed the ideal situation that is described above, in the real conditions the coincidences of DP are usually more complex. Not all DP of one combination “C” must have common development solutions and one particular DS could be CDS for any number of DP.

$$\begin{cases} CDS = DPx \cap \dots \cap DPz \\ CDS \in DPx, \dots, DPz \end{cases} \tag{7}$$

where x...z are any DP from one combination of development plans.

In one combination of DP the group of n employees, the number of possible DG can be calculated as follows:

1. If the number of DG participants is fixed – k, then:

$$DG_n^k = \frac{n!}{k! * (n - k)!} \tag{8}$$

2. If the minimum number of DG participants has been prescribed – s, then:

$$DG = DG_n^s + DG_n^{s+1} + \dots + DG_n^{n-1} + DG_n^n \tag{9}$$

For example, the number of combinations of



development plans has to be found for the group of 12 people, if the minimum DG is 6 people. If each employee would have only 1 DP, the possible number of combinations would be  $DG=2,510$ .

If each employee would have 2 DP, the possible number of combinations would be  $M=4,096$ .

The total number of combinations under analysis is:  $AG^2=AG*M=2510*4096=10\ 280\ 960$

It would be a large amount of calculations which can be performed only with the IT support.

### 3.2 Pre-planning Optimisation of Development Plans

Pre-planning optimisation approach is based on optimisation of the group members' competence gaps. CG of several employees are analysed and compared to identify the common components and seek for the most suitable development solutions. In the further planning process, this development solution is introduced in development plans as a mandatory element. The scheme of process has been displayed in Figure 5: "Scheme of process of pre-planning optimisation of development plans".

The results of the analysis of CG are summarised and contain information on competences of all levels (skill, skill group, etc.) (Judrups et al., 2015) out of all CG, how many and which employees' CG includes this competence and how many suitable solutions were found in the catalogue of DS. The example of results of analysis has been summarised in Table 1: "Example of results of CG analysis".

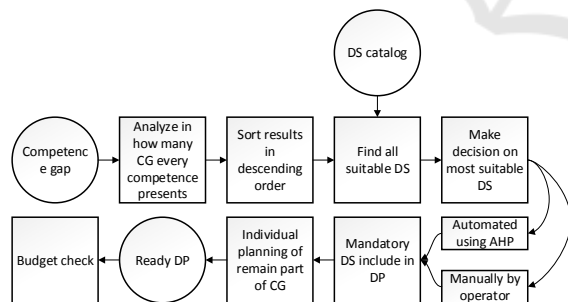


Figure 5: Scheme of process of pre-planning optimisation of development plans.

Manually or automatically selected DS are included in the development plans as the mandatory DS and cover part of CG. The remaining part of CG, DS are planned in line with HRDMM.

In the next step the most suitable DS has to be selected out of all selected DS. It can be performed in two ways: manually, when the planning operator takes decision on the basis of information provided

by an information system (IS) or automatically using AHP (Triantaphyllou, Mann, 1995).

Automatic application of AHP to the group is performed the same as when AHP is applied when selecting development plan (Kazakovs, 2014b).

The completed development plans, if necessary, are verified on the basis of financial indices.

When performing optimisation of pre-planning group plans, the minimum number of employees has to be defined in one DS implementation group. This provides opportunity to organise development process part in groups, selecting the most suitable solutions for the group and selecting individually the most suitable DS.

## 4 CONCLUSIONS

The human resources development planning can be analysed from two viewpoints. On the one hand, to achieve employees' development efficiency and development goals, in the planning process, when the most suitable development solution is selected, individual aspects have to be considered, assessing development needs of certain employees and seeking the best way to satisfy these development needs. In this way an individual approach is ensured for the planning of HR development.

On the other hand, implementation of individual development plans becomes time-consuming from the point of view of process, due to the high diversity of DS. This causes increased expenses and complications in logistics in implementation of development plans.

When developing HRDMM approach to development planning of the group of employees, requirements were set to reach a compromise to achieve efficient implementation at the same time retaining individual planning preferences, combining employees involved in development in groups, if a full-time learning development method is selected.

Table 1: Example of results of CG analysis.

Title of profile's element	How many employees lack this competence	How many DS were found
Competence 1	12	3
Competence 2	11	4
Competence 3	4	1
...		
Competence N	1	2

During the study, two approaches were developed

for supplementing HRDMM with optimisation of development plans:

1. Pre-planning optimisation within the framework of which the needs of employees involved in development process are analysed prior to development planning. Competence gaps of employees are analysed and common elements are identified that are similar for several employees. Suitable DS are applied to these elements that become parts of the individual DS;
2. Post-planning optimisation analyses the complete individual DP, in which DS same for several employees are identified to join these employees in one DG during the implementation phase.

Verification showed that application of both methods provides different results. This is because optimisation is applied to different phases of planning process. As a result, optimised plans are different:

Pre-planning optimisation can achieve implementation of DG in the majority of development needs, compared to post-planning optimisation. However, this is performed by reducing the level of individualisation in the development planning. In other words, individual interests are ignored because of the group's interests.

Post-planning optimisation allows retaining individualisation in full, combining in DG only those employees with the same recommended DS. In this way the group's interests are not implemented in full to retain the individual planning in full.

However, it can be concluded that both methods provide good optimisation results. Decision as to which method should be applied depends on several factors. However, in real life, development planning operator might want to receive the first and the second result to assess them and make the decision.

An IS based on HRDMM and group optimisation methods would provide new level of employee's development planning, that hasn't been introduced on the market yet.

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## REFERENCES

- Jenkins, A., 2015. The Advantages of Training Employees in Groups. In *chron.com*: <http://smallbusiness.chron.com/advantages-training-employees-groups-15984.html>.
- Judrups, J., Zandbergs, U. & Kazakovs, M., 2015. Competence based human resource development solution. In *Engineering for Rural Development*, pp. 669--674. Latvia University of Agriculture. Riga.
- Kazakovs, M., 2013. *Pre-research review* (Priekšizpētes pārskats), SIA „IT kompetences centrs”. Riga.
- Kazakovs, M., 2014a. Analysis of Factors Influencing the Choice of Solutions for Human Resource Development. In *Procedia - Social and Behavioral Sciences*, vol. 156, pp. 111--115. ELSEVIER.
- Kazakovs, M., 2014b. *HRDMM validation and adjustment* (Cilvēkresursu attīstības modeļa validēšana un koriģēšana), SIA „IT kompetences centrs”. Rīga.
- Kazakovs, M., Verdina, A., & Arhipova, I., 2015. Automation of Human Resources Development Planning. In *Procedia Computer Science*, 77, pp. 234--239.
- Saaty, T. L., 1990. How to Make a Decision: The Analytic Hierarchy Process. In *European Journal of Operational Research*: vol. 48, pp. 9-26.
- Saaty, T. L., 2008. Decision making with the analytic hierarchy process. In *Int. J. Services Sciences* vol. 1, No. 1, pp.83-98.
- Triantaphyllou, E, Mann, SH., 1995. Using the analytic hierarchy process for decision making in engineering application: some challenges. In *International Journal of Industrial Engineering*: vol. 2, Issue 1, pp. 35-44.