An Integrated IT-Architecture for Talent Management and Recruitment

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Abstract. Already in 2001 Donahue [7] argued in her Harvard Business Review article that it is time to get serious about talent management and in 2005 Hustad and Munkvold [11] presented a case study of IT-supported competence management. Based on Lee's suggested architecture for an holistic e-recruiting system [16] and the general research on e-HRM the aim of this paper is to suggest an integrated IT-Architecture for talent management and recruitment following the design science guidelines proposed by Alan Hevner [10] to support both the recruiting and the talent as well as competence management activities of a company.

1 Problem Relevance

A recent study by the Boston Consulting Group and the World Federation of Personnel Management Associations suggests that "People have emerged as a new source of competitive advantage. Consequently, the demand for skilled people is rising at the same time that shortages abound" [24]. This clearly demonstrates the problems that will in future have to be faced by businesses, and above all their personnel departments. Since, on the one hand, increasingly fewer people are available because of Germany's demographic situation and, on the other because of a lack of suitable training, there will be a shortfall of about 1.2 million academically trained personnel by 2020, it will become even more difficult to recruit competent staff [20]. Nevertheless, it is precisely this highly qualified staff that will be needed to ensure a sustainable competitive advantage over competitors in the long term [21]. As a consequence, personnel development and personnel retention are becoming, next to recruitment, the main focuses of the responsibilities of the personnel department. The importance of these disciplines is also made clear in the annual survey produced by [19]. They investigate among other things the major challenges faced by the Chief Information Officers of top American companies, and "attracting, developing and retaining IT professionals" were top of the list for the first time in their 2007 study [19]. The latter includes not merely the recruitment of new staff but also the development of their capabilities and their long-term retention in the company [11, 12, 17]. This

process is also known as "talent management" which can be defined as the management of the supply, demand and education of talent within an organization [23].

To deal with these problems, HR processes can call on the support of new electronic media [5, 6, 8, 25]. There has already been an initial approach to a holistic scheme for electronic (E-) recruitment processing designed by [16], which enables swift electronic access to a pool of applicants.

The aim of this paper is to build up step-by-step an architecture which will ultimately support both recruitment and personnel development processes by means of appropriate systems. This architecture is intended to take into account the various different reasons for which a company might wish to develop and train its staff.

We structure our paper for this purpose following the principles of Design Science [10]. In Section 1 we briefly outline the relevance of this topic to the basic problems against the background of the demographic situation and the shortage of well qualified staff. Section 2 contains a review of the literature on various personnel development processes, an E-recruitment system, fundamental research results about competence as well as a short explanation of the approach of Design Science. In Section 3 we describe the steps in the development of an IT-architecture for personnel development which is ultimately integrated with [16] recruitment system. In the last section we summarize the most important results and indicate both the limitations of this architecture as well as areas in which there is scope for further research.

2 Research Rigor

2.1 Design Science

Design Science, the research method proposed by [10] in 2004 is an extension of behaviorist methodology. Behaviorism attempts to predict what effects the introduction of IT within organizations will have with the aid of theoretical propositions. Within the Design Science framework artifacts which can be employed within businesses to solve problems are developed and evaluated. For the implementation of this framework, seven guidelines which should be followed to use the principles of Design Science in the field of information systems (IS) are presented [10]. In this paper we will develop our IT-architecture following these guidelines.

2.2 Personnel Recruitment

Before we explain Lee's 2007 approach [16], we first describe the individual processes that are fundamental to personnel recruitment.

2.2.1 Individual Personnel Recruitment Processes

As one can see from the left-hand side of figure 3, it is necessary at the beginning of the recruitment process to discover what a company's future personnel requirements will be. Then the skills that the new personnel must have are input, communicated and authorized before the job advertisement can be finally published [6]. At the same

time job-seekers can search through an online database and submit their applications directly. After the personnel department has searched the database (DB) for candidates, their applications are evaluated and initial interviews are held. Finally, the company negotiates a contract with the chosen candidate, so that the recruitment process reaches a conclusion that is satisfactory for both parties. [16]

2.2.2 e-Recruitment System

To implement the processes explained in the preceding section Lee [16] developed an e-recruitment system. This requires 8 sub-systems, which can be seen on the right-hand side of figure 3. Lee's paper will give a more detailed presentation of the more broadly relevant systems and their purposes. We will use this proposed IT-artifact to develop an integrated architecture for talent management and recruiting. Since we would like to base our work on the most up-to-date knowledge in discussing the IT-architecture in Section 3, [15] have extended Lee's initial suggestions to include the steps of the Employer Branding process: Please consult their suggested architecture for more details [15].

2.3 Personnel Development Processes

One way of combating vacancies in companies is the process described above, that is, acquiring outside personnel for the company. On the other hand, the required personnel can also be acquired internally by selecting members of the company's current staff and preparing them suitably for their new responsibilities [7]. To do this, it is often necessary to introduce training measures which will enable staff to develop their capabilities [4, 7]. The concept of personnel development is, however, characterized by "great heterogeneity and lack of clarity" [2] (p. 2). As a result, we find a large number of definitions of personnel development in the literature.

To provide a consistent understanding of the concept of personnel development in the sections that follow, we base ourselves on the definition of [9], who regard personnel development as a function of personnel management, whose aim it must be to provide all members of staff with training and qualifications enabling them to carry out both present and future tasks. In the process those individual capabilities of the personnel which serve the achievement of the company's goals should be encouraged. This positive alteration in the qualifications of the staff is understood as a process consisting of a series of several linked activities [9].
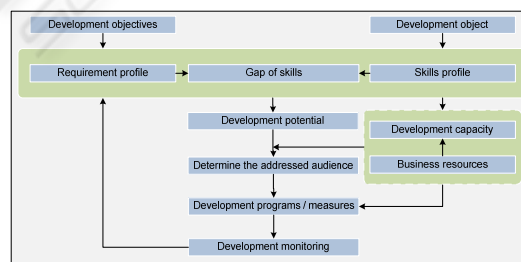

Fig. 1. Personnel Development Process (Source: [22]).

Since, as described in Section 3, a company may have several different reasons for developing the capabilities of its staff, we have chosen from the literature a personnel development process which supports this aim. Such a process is defined by [22], as represented schematically in Figure 1. In this process the gaps in the capabilities of each employee are deduced from the difference between their 'capability profile' and the profile of requirements defined by the company. This reveals how suited an employee currently is for a given job. Building on this, those employees who are eligible to take part in development activities but have not yet been able to acquire competences that are available are given a deadline for completing the relevant training. Frequently an employee's entire potential cannot be fully exploited because the company only has limited resources available. After successful completion of a training program the 'capability profile' is updated and checks are carried out to see whether the employee now satisfies the conditions of the required profile and/or whether the training program actually provides the desired competences [22].

2.4   Competence

In order to select candidates for vacant posts or training programs from within a company, it is desirable to store their qualifications long-term in a database in order to have quick access to them.

In recent years there have been a number of publications dealing with the themes of competence, competence catalogues or competence management [14]. To be able to provide a structure for the competences available in a company, a classification is set up. [1] suggested in this context that the parameters should be subject, methodological, human and social competence. To avoid ambiguity within the classificatory scheme, competence catalogues set out "a tested vocabulary for competence that is used on all occasions where competence plays a role" [14] (p.2). The individual competences of each employee must also be evaluated. Accordingly, mention must be made for each employee of how strong each individual competence is. Various research programs recommended the use of a five-point, and therefore uneven, scale [18], in spite of the problems caused by a tendency to prefer the middle element too frequently [13]. As well as permitting a finer distinction between grades of competence because of the neutral centre, this also makes it possible to avoid making directional decisions in cases of indecision or when a competence is absent [3].

3   Design as a Search

3.1   Determining Future Personnel Requirements

As can be seen in Figure 2, the company first investigates how high the future demand for personnel will be. To make an informed decision, those responsible has access to data from previous periods, since the decisions made here will have far-reaching consequences and are also influenced by many complex factors. For example, the company's fundamental strategy has to be taken into account. If the company

plans expansion, new branches or sites, a merger or something comparable, then its long-term personnel requirements is adapted to suit this. The state of the national economy also plays an important role.

Thus in times of positive economic growth the company needs to quickly take on new staff in order to fulfill orders successfully, or when a recession threatens, workers must be made redundant to avoid excessively high monthly fixed costs. When the company has discovered its future personnel requirements, the difference between these and the current staff situation must be calculated. Depending on this result, the personnel department can look for new staff, prepare staff for new projects by training, downsize or just leave everything as it is.

3.2 IT Systems for Internal Personnel Recruitment Processes

3.2.1 Fundamental Procedures

In this section we consider what occurs when a company selects qualified, internally available staff and promotes them, optionally preparing them for their new duties by means of training programs. The company can follow this path if no suitable external staff can be employed or if to do so would be too expensive.
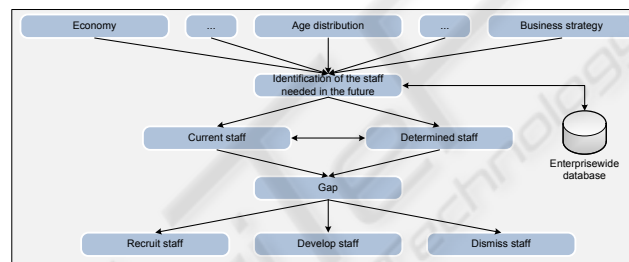

Fig. 2. Overview of Personnel Management Tasks.

Firstly, candidates for these posts, who fit the requisite job-profile or at least come close to it, must be identified among the current staff. In order to do this a requirement profile for the post that is to be filled must be defined. If a similar profile is available in the DB from previous recruitment campaigns, it can be reused. Otherwise a kind of dummy-employee with the optimal competences for the vacant post is entered into the 'Profile Creation Management Subsystem' (PCMS). The capability profiles of all actual employees are defined in terms of their current competences and should be consulted in the DB at each step when new posts are being filled, and updated if necessary. For both profiles a five-point scale is used because of the advantages described in Section 2.4. In the requirement profile it seems most sensible to use the neutral element if a particular competence is not relevant to the vacant post; we would also use the two positive values on the scale to define how strong the competence should be for an employee to be best able to carry out the tasks. In our opinion the two negative elements should only be used in extreme cases. This is more closely specified in a unified way for the whole company in the underlying catalogue of competences. The competence definitions should also be provided here.

Next, a system is needed to work out the variance between the requirement profile that has been defined and each member of staff. As described in Section 2.2.2 the PSMS has is required to perform similar tasks during the recruitment process. The similarity between employee profiles and requirement profile must now be tested not only for those who have applied for a post, but also for all members of staff.

Which candidate can now be considered for the post also depends, as explained in 2.3, on whether the company has resources available for personnel development.

3.2.2   Internal Recruitment without Previous Personnel Development

If the company does not have sufficient resources available at present to train employees for the new post, it is possible, using the PSMS as shown in Figure 3, to determine, on the basis of the capability gaps of each employee, which one has the most of the competences required.

3.2.3   Internal Recruitment Preceded by Personnel Development

It is more advantageous for the company if resources are available to prepare the selected candidate as well as possible for the new post by means of a training program. As well as the index value calculated in Section 3.2.1, the development potential of each employee should also be taken into account in the choice of candidate, as shown in Figure 3. We do not consider here whether the company determines this potential by expert judgment or by portfolio techniques, since both procedures have their advantages and this also depends on company size and the capital available [22]. These results are then entered in the relevant capability profile under social competences using the PCMS, and should once more be classified company-wide in a unified way using a 5-point scale (cf. Section 2.4). Additionally it is possible to have a justification of this decision available in the profile in the form of a running text, so that the previous decision will be comprehensible in future tests.

In order to filter out the best qualified candidate, distinguished by both present competences and also a high level of development potential, an index value is calculated in the 'Profile Matching Management Subsystem' (PMMS). Other components can also contribute to this calculation.

When the most suitable candidate has been found, the 'Method Matching Management Subsystem' (MMMS) is used to determine the training program best suited to providing them with the competences they do not yet possess. For this purpose all available training programs, together with the competences which attending each of them will improve, must be stored in the company-wide DB. First one could extract from the PSMS those competences which the candidate does not have but needs in order to best carry out the duties of the new job. Then the MMMS will call up all possible training programs which could communicate the missing competences to the employee. This could be done using simple Information Retrieval methods.

Finally spot checks could be carried out to see if the training programs do actually produce the required competences. After analyzing the results, conclusions could be reached about what competences had actually been achieved. By comparison with the employee's previous competences, the training program can be subjectively evaluated. In general, several case studies should be stored in the DB, each of which tests

different specific competences. These studies should be available to the trainers by means of the 'Method Performance Management Subsystem' of the DB, into which the trainer can then enter the results of the work on the case studies after evaluation. Finally, the trainees are entered into or extracted from the MMMS so that their updated competence profiles can be stored in the database.

3.3 IT Systems for Personnel Development Processes

Since it is not always absolutely necessary to train personnel and then directly promote them, this section will describe two other possible modes of proceeding.

3.3.1 Personnel Development for Reasons of New Strategic Orientation

It is sensible to initiate training programs when a company, for example, changes its long-term strategy, thus requiring new competences in the company. If the company plans off-shoring, then it is clearly desirable from the company's perspective that some employees should learn the new language and its culture in order to enable better communication between the different locations and so that people mutually understand and respect each other's cultures.

The order to do this by developing training programs which suit their strategy can come directly from the company management, who are also responsible for creating the strategy. This can be stored in the DB together with the competences it requires, so that the various sub-systems have access to it.

This could be carried out in a way analogous to the approach suggested in Section 3.2, in that selected employees could be directly promoted so that they could then oversee a project or a similar activity long-term in the new location. Courses which improve the general level of education of the staff could also – at least, if the company's resources permit – be open for all to attend, which could be achieved using the architecture described in Figure 3. Since these offerings are made use of by relatively few employees, they would not result in such high costs.

3.3.2 Anticipatory Development of Missing Competences

Companies may find that they very frequently have a shortage of employees with particular competences. With the approaches used until now, one either had to recruit personnel with these capabilities, which is expensive, or use time-expensive courses to train employees who would only be available to the company after successfully completing their training.

The company could use the procedure illustrated in Figure 3 to train employees in a purposeful way even if there were currently no acute demand for this. If a requirement profile with these previously rare competences were then sought, suitable candidates would immediately be available in the company. To identify the competences of which there is a frequent shortage, access to all requirement profiles used so far must be made possible. No matter whether jobs are advertised internally or externally, the job profile and the relevant competences should be permanently stored by the PCMS in the DB.

Since the required competences are consistently stored in a system, the sub-system only stores additionally how often any given profile or competence was required by the personnel department. This provides the PCMS with yet another responsibility, that is, not only that the personnel department enters and stores specific profiles, but also that it should be possible by means of this sub-system to discover how high the demand for particular competences and profiles has been in a given period.

If there are as yet no training programs to develop the most frequently required competences, the company can offer new or supplementary training in the light of this knowledge. Then specific employees can be selected by the personnel department using the process described in 2.2 and can then be offered the opportunity, for example by electronic means, to take part in this training without paying.

3.4 Integration of the Personnel Recruitment System and Development System

Since we have now shown several different possible ways of implementing systems in the area of personnel development, we would like to explain now how they can be integrated with Lee's architecture [16].

As shown in Figure 2, the starting point should be the top management since they determine the direction of personnel recruitment and development by means of the strategy they lay down. As described in section 3.1, deciding how many personnel to employ and what competences they should have in the future is a difficult process. For that reason the company should retain the decisions made in the past, the environmental or industrial factors that prevailed at the time as well as the results of those decisions in the 'Reference Management Subsystem'. If this information is also kept subjectively by several employees, the business has supplementary information about which activities might be useful in the future. Optionally, one could also record measures which, seen retrospectively, were not as successful as they might have been.

This decision now influences the way recruitment and personnel development subsequently proceed. Since we have already explained both architectures individually, we now intend to discuss only those sub-systems which can be seen as interfaces between these two approaches.

This shift in responsibilities makes sense, since the architecture becomes more flexible as a result and it is possible for companies to introduce only those sub-systems which support individual critically important processes. This also makes it clear that it is profiles, consisting of competences, that should be stored at the company-wide level and not, for example, the exact formulations of job advertisements. The latter could optionally be stored alongside every competence profile in the DB, but it is the competence profiles that are decisive when defining index values or competence gaps. The PSMS is also needed both to support personnel recruitment processes and to ensure that personnel development processes run as efficiently as possible. The tasks necessary for achieving this have already been explained in sections 2.2.2 and 3.2. It is also possible to observe the employees' development potential long-term and continuously. This can be done with the help of the CRMS by extending the tasks originally described in Section 2.2.2. Using the CRMS one could build up lasting contact with particular employees, and in the process observe their

development. From this process one could derive indicators showing whether these employees would in future be capable of taking on more responsibility.
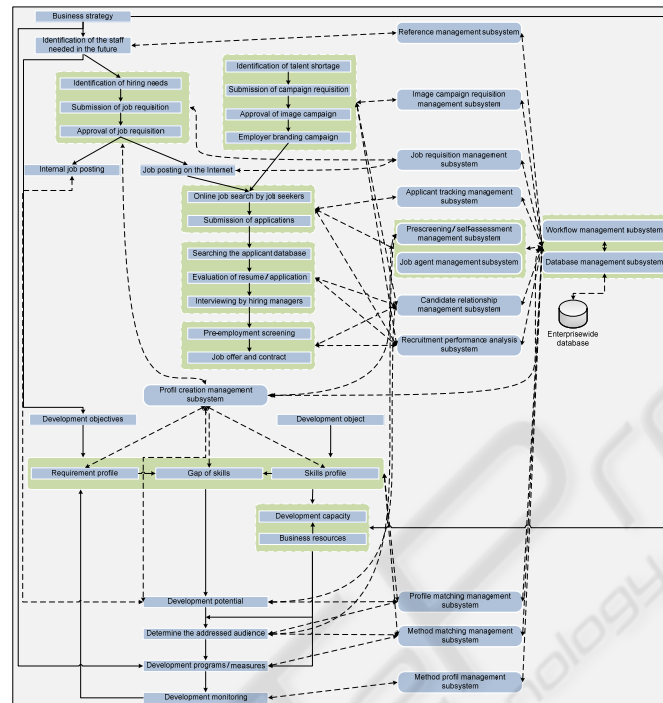

Fig. 3. Integrated IT Architecture for Personnel Recruitment and Development Processes.

4 Communication of Research

4.1 Limitations

It should be noted that the architecture suggested is so far based only on a literature review. Thus there has been no validation by case studies or empirical assessments which would make it possible to quantify its actual usefulness. First ideas of an IT-supported competence management system can be find in a case study at Ericsson [11]. One should also consider the aspects to which [16] has already called attention. He made it clear that his e-recruitment system is expensive and complex. Expanding this architecture increases the costs for realizing the whole concept as well as the complexity, and thus a company must decide for itself which elements of the architecture to introduce. This can be decided within the company in the light of the expected benefit, and depends among other things on what resources are available in the company, what branch of industry it is active in, how big the company is, as well as on the company's strategy for the future, depending for example on whether they intend to benefit from the advantages of being a 'First Mover'. Apart from this it should be noted that the architecture can essentially be used in any country or any industry.

4.2 Suggestions for Further Research

Future research should initially establish exactly what benefits this architecture provides. It would also be possible to extend the architecture. Thus, for example, the systems used until now could support the career planning of individual employees and clearly show well-trained employees what their career prospects are. Here we are approaching the idea of personnel retention, which is also not considered in the current architecture. The PMMS and MMMS sub-systems can also be seen as recommender systems for which algorithms could be devised.

4.3 Research Contributions

Because of the anticipated future shortage of qualified staff, companies will, above all, have to develop their current personnel in order to be able to generate a lasting competitive advantage over their competitors on the basis of their workforce. To enable this, we have presented a comprehensive IT architecture, based on the Design Science approach [10], which integrates recruitment processes with personnel development processes, supporting them with several different sub-systems.

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