

EFFECTIVE INTEGRATION SOLUTIONS FOR HYBRID CLOUD MIGRATION TO SAAS: A HUMAN CAPITAL MANAGEMENT CASE STUDY

*Nevena Staevsky, Rositsa Doneva, Silvia Gaftandzhieva **

University of Plovdiv Paisii Hilendarski, Plovdiv
Bulgaria

* Corresponding Author, e-mail: sissiy88@uni-plovdiv.bg

Abstract: The transition to a SaaS model often faces significant challenges, especially when integrating cloud-based solutions with existing established local systems, workflows, and data sources. This paper presents the results of a study related to the creation of flexible, scalable models and strategies for integration in hybrid cloud migration to SaaS. Through a case study of a company migrating its Human Capital Management infrastructure, we analyse the integration requirements necessary for a seamless transition. By systematizing these requirements and presenting practical design solutions, the study provides a framework for operational management to overcome real-world implementation hurdles. The research outcomes would significantly assist organizations to achieve full hybrid integration, ensuring both service continuity and long-term scalability during the move to the cloud SaaS model.

Key words: Cloud migration, SaaS model, hybrid cloud integration, human capital management, SAP cloud solutions, cloud to cloud integration.

1. INTRODUCTION

In 2025, spending on public cloud services such as Software as a Service (SaaS) exceeded the 19.2% forecast given by Gartner in 2024 [1].

SaaS offers businesses access to powerful subscription-based software applications hosted in the cloud, eliminating the need for local infrastructure and reducing maintenance costs. However, the transition to a SaaS model is not without its challenges [2], especially when it comes to integrating newly adopted cloud-based software solutions with existing established local systems, workflows, and data sources, i.e., hybrid SaaS solutions. In these cases, along with gradual integration with the cloud, the smooth running of established business processes must be ensured as well. By choosing the right integration solutions, organizations can achieve reliable and efficient data transfer within complex corporate infrastructure. Experts and scientific research in the field of cloud migration focus primarily on challenges related to organizational resistance to change, lack of skills among company employees, and concerns about data security and protection [3-4]. Currently, there is little research on the factors that

influence successful hybrid cloud migration to SaaS and finding effective integration solutions [5].

The paper presents the results of a study related to the creation of flexible, scalable, effective models and strategies for integration in hybrid cloud migration to SaaS. In order to increase the applicability, effectiveness, and quality of the research results so that they correspond to real needs and help overcome real practical integration problems, it was conducted within a specific company that is implementing a real initiative related to digitalization and offers a suitable real environment for development and experimentation. The target company is migrating data and integrating internal human capital management (HCM) systems with SaaS services using a hybrid cloud approach.

Based on an analysis of the specific target cloud and corporate infrastructures, the article systematizes the basic requirements for integration solutions that ensure the implementation of flexible strategies for solid hybrid migration to the SaaS cloud platform. One of the integration solutions proposed as a result of the study is presented in more detail. It is related to a fundamental aspect of HCM [6] – ensuring compliance with regulatory requirements (prohibitions or sanctions) of corporate HCM systems.

2. TARGET CLOUD AND CORPORATE INFRASTRUCTURES. ANALYSIS OF REQUIREMENTS FOR INTEGRATION SOLUTIONS

Since historically the HCM systems of the target company have been built on the basis of SAP software solutions (<https://www.sap.com>), the cloud infrastructure that the company uses and on which the study is based is also offered by the SAP corporation.

The SAP cloud ecosystem offers great flexibility and opportunities, covering a wide range of services. Hence, only those platforms that are related to the following presentation and the proposed integration solutions are considered here. These are SAP SuccessFactors and SAP Cloud Integration.

SAP SuccessFactors [7] is a cloud-based SaaS platform from SAP that, like the most SaaS solutions, uses multi-tenant architecture. Through instances/tenants hired by an organization, SAP SuccessFactors offers cloud-based HR capabilities - from basic human resources (HR) administration up to managing the entire employee lifecycle, starting with hiring and ending with retirement (Hire to Re-tire). The individual modules of SAP SuccessFactors optimize HR operations and include: Employee Central (a central module for managing the employee and organizational data, serving as a backbone to all other SAP SuccessFactors modules), Recruiting of new candidates, Onboarding of starters, Learning, Compensation, Performance and Goals, etc. SAP SuccessFactors provides the SaaS service to its business customers in the form of web-based solutions – portals that provide a single point of access for managing the corporate HR business processes and data [8]. For its purposes the platform provides interactive tools for creating, configuring, and managing relevant data models, workflows, business rules, events, etc.

SAP Cloud Integration (SCI) is an iPaaS platform [9] that enables customer organizations develop comprehensive integration processes between different local or provided in the cloud SAP or non-SAP systems they use. They are developed in the form of integration flows (iFlows), which determine what messages are exchanged between

the systems, i.e., the sender and receiver. iFlows are grouped into integration packages according to their purpose. The SCI Integration Flow Editor provides a convenient environment for modeling iFlows by visually representing their business logic and using a variety of SCI tools (e.g., adapters such as HTTP, SFTP, ProcessDirect, events such as Start Timer Event, etc.) to implement the details of the message processing. The implementation can cover the definition of the different components of messages (headers, properties, and body), coding of the business logic using scripts (Groovy Script, JavaScript), determination of the communication method (using adapters and connectors; based on various protocols such as HTTP, SOAP, OData) and data exchange between systems (via web services; exposing or consuming of APIs), mapping and transformation of messages and data (e.g. using XSLT technology) between different formats (XML, JSON, CSV), setting the authentication method (Basic Authentication, Client Certificate, OAuth2), etc.

The target company applies a hybrid cloud approach when migrating its HR processes and activities to the SaaS cloud services of SAP SuccessFactors. As a result, the target corporate infrastructure is a hybrid one — SAP SuccessFactors takes care of the core HR processes (Recruiting, Onboarding, etc.), while more complex processes such as Payroll and Time Management are managed within the on-premise HCM system because of its stability and control options. A number of branches of the target company are maintained in the local SAP ERP HCM [10], which is also responsible for managing employee data related to compliance with various legal or regulatory requirements, including tax data, social security information, garnishments, etc.

After a successful initial migration, SAP SuccessFactors becomes the leader in terms of entering personnel data and is its main source, i.e., it plays the role of the so-called Single-Point-of-Truth (SPoT). From this point forward, the integration between the two environments is activated [11] – the data entered in the cloud is replicated/transferred to the on-premises environment. With the help of the selected hybrid integration model, the two environments remain in sync, avoiding the need of double maintenance. In addition to SAP ERP HCM, other local systems that are integrated with SuccessFactors include the accounting and financial transaction control system, the platform that manages the identity and access to the organization's digital resources, etc.

The corporate hybrid cloud infrastructure is based on SAP SCI, which serves as middleware. The migration of data from SAP HCM to the cloud, as well as the subsequent integration of the local and cloud environments, is carried out with the help of SAP SCI standard (delivered by the provider) or custom (developed by the customer) iFlows.

As a result of empirical observations during the initial migration process and subsequent integrations of SuccessFactors with SAP HCM and other local or cloud systems, a number of requirements for the proposed integration solutions have been formulated so that they ensure a complete hybrid migration to the SaaS cloud platform. Table 1 presents the most important of the requirements identified, together with the empirical observations from which they derive, and corresponding examples of integration solutions designed and developed within the scope of the study.

Table 1. Integration solutions: Observations, requirements, examples

Observation	Requirement	Example Solution
<i>For the model of integration of internal HR systems with the cloud to be effective, it is necessary to ensure the fullest possible automation of personnel-related processes. Of particular importance is compliance with various regulatory requirements, standards, and control mechanisms under national and international regulations or sanctions imposed in the field. To date, activities to avoid regulatory violations have been carried out by employees of the organization "manually" or semi-automatically</i>	Integration solutions must ensure the automation of compliance control with the respective regulatory requirements and standards in the company's HR processes.	Integration of SuccessFactors (Employee Central, Recruiting) with a third party cloud platform for compliance check of both active employees (periodically) and candidates (upon approval of their job application)
<i>Standard integrations provide data transfer from the cloud to the local system, which does not fully meet the organization's requirements. In a number of cases, data exchange in the opposite direction, namely from on-premise to the SaaS platform, must be ensured, which requires the development of additional integrations</i>	It is necessary to ensure data exchange between the local and cloud environments in all cases where this is not provided by the standard capabilities of the selected SaaS solution	Replication of the personnel number of a newly hired employee generated by the local system into the respective employee profile in the cloud, i.e., to the Employee Central module of SuccessFactors.
<i>In real-world operation of hybrid SaaS solutions, temporary interruptions in network connectivity between the cloud and local components are often observed (due to vendor maintenance, unavailable local services, hardware failures, malware)</i>	Integration solutions must provide (at the application and infrastructure level) appropriate resilience mechanisms (exception handling, timeout, retry, fallback, error reporting) to prevent business processes from being blocked.	All integration solutions provide for different resilience mechanisms
<i>Due to the inherent asynchrony of the hybrid cloud approach, data in the cloud and the local environment may be temporarily inconsistent</i>	The integration architecture must provide compensatory mechanisms for <i>inconsistent data</i> issues (e.g., resynchronization, data flow traceability)	Periodic synchronization of payroll-relevant data for employees (from the local system to SuccessFactors), development of mechanisms for tracking the results of data exchange and retransfer if necessary

Observation	Requirement	Example Solution
<i>An invariable feature of data models, both in the cloud and in the local environment, is their constant dynamism, resulting from changes in business requirements, in the functionality of the leading SPoT cloud SaaS solution (SuccessFactors), etc.</i>	Integration solutions must maintain consistency between cloud and local environments in terms of both data models and data content	Flexible mapping to the SuccessFactors data model and exchange on the basis of full history records of contingent workers provided by a third-party Vendor Management System (AVAX[12])
<i>With indirect integration through file transfer via SFTP server between environments, data security and protection are largely at risk</i>	In the case of indirect integration data security and protection have to be provided.	PGP encryption of data before files are transferred to an SFTP server for indirect integration

3. INTEGRATION SOLUTION FOR HR COMPLIANCE CHECK

This section presents an example of one of the key integration solutions developed as part of the study, hereinafter referred to as *Compliance Screening*. It automates the processes of 'compliance screening' of all active employees (over 30000) of the target company (i.e., HR compliance check) to ensure that they are not subject to any restrictions or sanctions from various restrictive, anti-terrorism, or blacklists worldwide. In addition, the solution optimizes regulatory compliance within the organization by allowing checks to be performed as soon as candidates are approved, before they start working at the company. It is driven by business needs and therefore meets the requirement formulated in the first row of Table 1.

To ensure compliance with regulatory requirements in various areas of its operations, the company uses the AEB Trade Compliance Management platform [13] (AEB). Up to the implementation of *Compliance Screening*, regular compliance checks were performed semi-automatically using the AEB platform and they covered only the active employees of the company.

3.1. Overview

Compliance Screening was developed using SAP SCI as middleware and implements direct data exchange between SuccessFactors and the AEB platform (i.e., cloud to cloud). The integration affects two different Success Factors (SF) modules – Recruiting Management (RCM) for handling job applications and recruiting new candidates and Employee Central (EC) for managing active employees' data. So, from the source system perspective, the implementation includes two main (with two subordinate) screening options, named RCM Screening and EC Screening.

RCM Screening, with RCM module as its source, performs automated periodic (every 30 minutes) or individual screening of approved applicant(s).

On the other hand, having EC as a source, the EC Screening performs automated monthly (at 7 a.m. on the first working day of each month) or individual screening of active employees.

Figure 1 shows a diagram of the integration solution only for the periodic EC and RCM screening processes, since the implementation of individual screening is a subtask of the periodic one. In both cases, the data is read in portions from SF using the OData API (1), then converted into a format (JSON) suitable for the receiver system (2), and after that sent for verification to AEB via the provided AEB REST API (3). Additional processing takes place in case of RCM Screening - the compliance status of the job application is updated in SuccessFactors. Depending on the verification results in AEB, the job application can be set to *Released* (no matches were found in any sanction list), *Verification required* (a match is found and it has to be verified) or *Blocked* (after verification the match is confirmed) (4). At the end of the execution, a summary log entry containing information about the verification results are created in the recipient system (5).

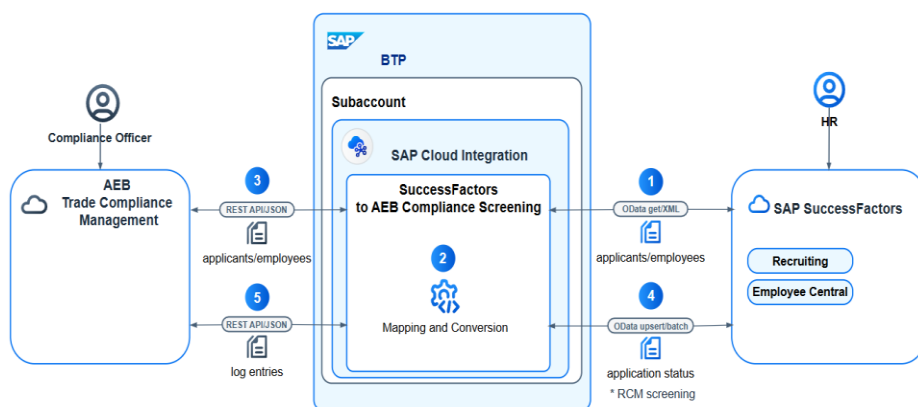


Figure 1. Periodic screening

The different frequencies of periodic screening, depending on the data source (EC or RCM), require that, besides the main iFlow for performing the automatic check, an additional one be developed for the purposes of its adequate launch. The additional iFlow's business logic consists of only three elementary steps – a parameterized Start (as per periodicity), an Invocation of the main iFlow (after the two possible data sources), and an End. Therefore, it is of no interest in consideration here.

3.2. Modelling the business logic of the main iFlow

The developed model of the business logic of the main iFlow is a complex diagram that cannot be presented legibly here. This section concentrates on the most important parts of it.

The main iFlow manages four variants of screening processes, respectively two (main and subordinate) for EC and RCM as data sources:

- 1) monthly for employees;
- 2) individual for a given employee;
- 3) periodic for all available approved candidates;
- 4) individual for a new approved candidate.

Essential, regarding the business logic of the flow, is the unified core implementation for these four variants of screening processes. They only differ at the very beginning by their four specific endpoint addresses using four inbound communication channels [14] - with `ProcessDirect` sender adapter for 1) and 3), with an `HTTPS` adapter and an `EntryPoint` provided for 2), and with a `SOAP` adapter and an `EntryPoint` for 4).

The most important steps in the core business logic are (see Figure 2):

- ❶ Setting values for the properties of the integration;
- ❷ Iterative processing of data for active employees/candidates being checked;
- ❸ Creating summary log entries in the AEB recipient system with information about the results of the verification of individuals.

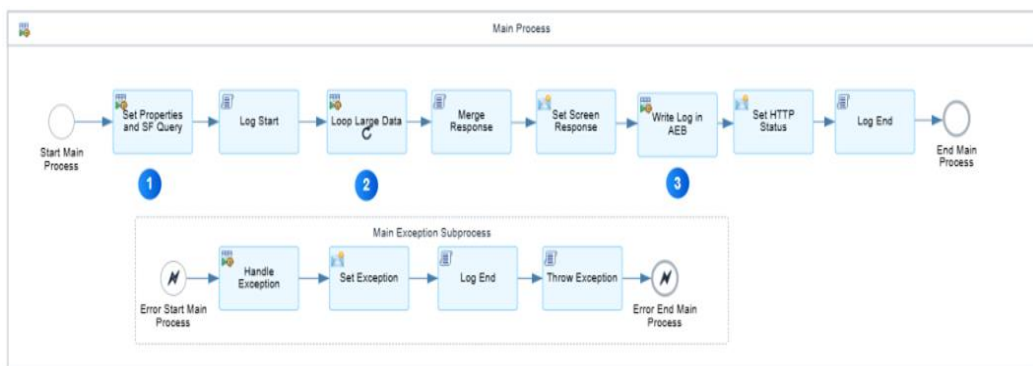


Figure 2. Main steps of the business logic

3.3. Implementation of main stages of the main iFlow

This section briefly presents the implementation of some of the more significant aspects of step ❷ of the main iFlow business logic (see section 3.2), which is the key to solve the integration problem. Some fragments of the instances illustrating the implementation (script codes, markup language codes, screen copies, etc.) are masked to hide sensitive data about individuals or the company itself.

In both screening options (EC Screening and RCM Screening), the standard SuccessFactors OData API [15] (which uses the OAuth2 authentication method) and a suitably developed OData request for reading employee/candidate data are used. The request is executed on correspondingly provided OData entity `EmpEmployment` or `JobApplication` and returns a filtered set of company employees or applicants objects in XML format.

Due to the significant amount of employee/candidate records in SuccessFactors, the data is processed in batches or pages, the size of which (in this case, 1000) is a configurable parameter of the SuccessFactors OData adapter. For this purpose, the integration utilizes the SCI tool `Looping Process Call` [16], which represents a cyclic call of a local subprocess with an end condition (until SuccessFactors continues to return portions of data). Fragments of the XML response from the SF OData request in the case of RCM Screening are shown in Figure 3.

```

<JobApplication>
  <JobRequisition>
    <FOCompany>
      <name>[REDACTED] </name>
    </FOCompany>
    <JobRequisitionOperator>
      <firstName>[REDACTED] </firstName>
      <lastName>[REDACTED] </lastName>
      <phone>[REDACTED] </phone>
      <email>[REDACTED] </email>
    </JobRequisitionOperator>
    <JobRequisitionLocale>
      <jobTitle>[REDACTED] </jobTitle>
    </JobRequisitionLocale>
    <cust_legalEntity>0422800</cust_legalEntity>
  </JobRequisition>
  <cust_sanctionStatus>
    <externalCode>TC</externalCode>
  </cust_sanctionStatus>
  <applicationId>199142</applicationId>
  <lastName>Anonymized</lastName>
  <firstName>[REDACTED] </firstName>
  <jobReqId>23621</jobReqId>
  <dateOfBirth>1981-01-19T00:00:00</dateOfBirth>
  <candidateId>182551</candidateId>
</JobApplication>

```

Figure 31. RCM Screening: Parts of the XML response from SF OData

Before being sent to the AEB system, the extracted employee/candidate data is converted from XML to JSON format, suitable for the recipient system. The implementation of this conversion involves two developed XSLT transformations and the use of a standard SCI tool for transforming messages XML to JSON Converter [17].

The first transformation for the RCM Screening case extracts the values of certain attributes from the processed job applications, which are used at a later stage of the execution. A fragment of an example result of this data transformation is shown in Figure 4.

```

<JobApplication>
  <JobApplication>
    <jobApplicationId>[REDACTED] </jobApplicationId>
    <jobRequisitionId>[REDACTED] </jobRequisitionId>
    <jobRequisitionTitle>[REDACTED] (m/w/d) </jobRequisitionTitle>
    <candidateId>[REDACTED] </candidateId>
    <candidateName>[REDACTED] </candidateName>
    <recruiterEmail>[REDACTED] </recruiterEmail>
    <recruiterName>[REDACTED] </recruiterName>
    <recruiterTimeZone>Europe/Berlin</recruiterTimeZone>
  </JobApplication>
</JobApplication>

```

Figure 4. Result of XSLT transformation in RCM Screening

The other XSLT transformation prepares an XML document for input to the standard SCI tool XML to JSON Converter. This transformation is used in both screening options. It extracts the data read from SuccessFactors, supplements it and creates a new XML document that fully corresponds to the JSON structure expected by the recipient system AEB.

The standard XML to JSON Converter aims to construct the final JSON request to AEB for 'compliance checking' of candidates or employees (see fragment of a request in EC Screening in Figure 5).

```

{
  "addresses": [
    {
      "addressType": "individual",
      "name": "Max Mustermann",
      "surname": "Mustermann",
      "prenames": "Max",
      "dateOfBirth": "1972-02-23",
      "referenceId": "10006743",
      "referenceComment": "LE: 04487700 - Hilti-Arbeitszeugnis-Service GmbH
        Final HR Approver: Hilti-Arbeitszeugnis-Service GmbH
        Email: hilti-arbeitszeugnis-service@hilti.com
        Employee ID: 10006743
        Employee Name: Max Mustermann
        Date of Birth: 1972-02-23
        System ID: SuccessFactorsEC
        Screening Type: Monthly Employee Screening",
      "condition": {
        "value": "PersonId_10006743_UserId_10006743",
        "description": "Person Id 10006743, Contract User Id 10006743 of empl
      }
    }
  ],
  "screeningParameters": {
    "clientIdentCode": "HILTI10006743"
  }
}

```

Figure 5. JSON request to AEB for EC Screening

Having built the body of the request in a suitable JSON format, the integration invokes the REST API provided by AEB to execute the screening, using the Basic Authentication method. After processing, AEB returns a JSON response, including two flags (matchFound and wasGoodGuy) for the verification result for each verified employee/candidate, as well as the identification number, reference comments, etc. (see excerpt from JSON response from AEB during EC Screening at **Error! Reference source not found.** 6).

```

{
  "matchFound": false,
  "wasGoodGuy": true,
  "referenceId": "10006743",
  "referenceComment": "LE: 04487700 - Hilti-Arbeitszeugnis-Service GmbH
    Final HR Approver: Hilti-Arbeitszeugnis-Service GmbH
    Email: hilti-arbeitszeugnis-service@hilti.com
    Employee ID: 10006743
    Employee Name: Max Mustermann
    Date of Birth: 1972-02-23
    System ID: SuccessFactorsEC
    Screening Type: Monthly Employee Screening",
  "matchFound": true,
  "wasGoodGuy": false,
}

```

Figure 6. JSON response from AEB during EC Screening

In the case of RCM Screening, the results obtained from the AEB check must be reflected in the RCM module of SuccessFactors. Since two objects in RCM

(JobApplication and JobApplicationComments) need to be updated for this purpose, the integration utilizes the OData batch [18] operation provided by the SF OData API, which allows for consistent updates of multiple dependent objects and combines the two relevant requests into a single one. The common request is constructed using XSLT transformation.

After processing all data portions, a summary log entry is sent to AEB, containing information about the number of persons checked and the number of matches found. If there are 0 matches, the log record is of type *Info*, otherwise it is of type *Restriction* (Figure 7).

Date/time ↕	Log type ↕	Level ↕	Event ↕
Oct 10, 2025, 9:17:34 AM	Partnersystemmeldung	✓	Info
Oct 10, 2025, 8:48:52 AM	Partnersystemmeldung	✗	Restriction

Figure 7. Log entries in AEB

At the end of the main iFlow, some additional final integration tasks are performed, which are not presented in detail here. They include exception handling, sending emails to the responsible departments with information about the matches found or problems encountered during the execution of the flow, etc.

4. CONCLUSION

Of particular importance to business organizations is that the cloud migration dictates frequent and significant changes in their customers' requirements, forcing them to constantly seek new ways to transform their business models, leverage new technologies, and stimulate innovation to improve flexibility, scalability, and operational efficiency.

The present study aims to contribute to the research on the creation of supply, extensible and effective models and strategies for integration in hybrid cloud migration to a SaaS model, based on relevant empirical observations. The experiments were carried out during the migration of data and the integration of internal HCM systems with the cloud to SaaS cloud services using a hybrid cloud approach. Since the particular environment involves concrete cloud platforms like SAP SuccessFactors and AEB Trade Compliance Management, a possible practical extension of the proposed integration solution(s) would be to develop a more generic and wide-ranging business logic. Such an enhancement is achievable through parameterizable configurations and customer exits and would implement communication between partner systems independent of the specific platform or its APIs. In addition, it could involve mapping and processing of data flows independent of the protocols or formats in use.

The requirements formulated in this study and the presented examples of designed and developed solutions support operational corporate management on their journey to the SaaS model cloud migration. The research outcomes will help organizations achieve a full hybrid integration, overcoming real practical problems in the concept and implementation phase.

It is important to note that the selected area of HCM is particularly fertile for the purposes of the study and does not limit its scope because it is part of the general management functions of any economic segment. Human resource management operations play a strategic role because they cover the entire life cycle of employees, thereby ensuring the achievement of companies' business goals.

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Information about the authors:

Nevena Staevisky – PhD student at Paisii Hilendarski University of Plovdiv. The topic of her dissertation research is “Cloud migration to a Software-as-a-Service model. Integration solutions”. Until now she is an author of five scientific publications (incl. two indexed in Web of Science, SCOPUS) and one book chapter with total 12 noticed citations.

Rositsa Doneva, PhD – Professor at Paisii Hilendarski University of Plovdiv. She is an author of over 220 publications (46 indexed in Web of Science and 50 indexed in Scopus) in the field of Intelligent Systems, Quality Assurance (of HE, e-Learning, Projects, Software, etc.), OOP, e-Learning, Learning Analytics, etc. with over 1000 citations.

Silvia Gaftandzhieva, PhD – Associate Professor at Paisii Hilendarski University of Plovdiv. She is an author of 160 publications (70 indexed in Web of Science and 78 indexed in Scopus) in the field of Quality Assurance (of HE, e-Learning, Projects, etc.), e-Learning, m-Learning, Learning Analytics, Data Analytics, Data Mining, Deep Learning, etc. with over 850 citations.

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