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# System Architecture for IT Talent Ecosystem Using Service Oriented Approach

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**Abstract**

The purpose of this research is to propose a System Architecture to facilitate the IT Talent ecosystem using a service-oriented approach. The need for this is important to support digital transformation in the IT Talent ecosystem. Human resources in the IT field are one of the key factors in implementing IT in organizations. However, the availability of IT human resources has not been able to meet the needs and challenges of the organization in synergizing IT and business. Meanwhile, on the other hand, the qualifications of IT human resources do not meet the existing competency standards. In this research, we use a service-oriented system development method. It consists of three stages, such as (1). Analysis and Observation, (2). Analysis from an in-depth interview, and (3) System Architecture Design, which includes Analysis Features of the Systems, Service Analysis and Identification, Specification of Architecture, and Layering. The novelty and findings of this research are a system architecture, which is called a middleware architecture, that can bridge entities in the IT Talent ecosystem to provide and use services to each other for support collaboration. In this study, we proposed a system architecture that acts as middleware to support collaboration and integration in the IT Talent ecosystem. We proposed TALENT-IT, which acts as a service bus mechanism. We used a service-oriented approach to develop this platform. The results of this study are: list of features, list of services, SOA layer, SOA architecture, and monetization feasibility and challenges.

*Keywords:* IT Talent Ecosystem; SOA; Platform; Integration; Service Oriented; System Architecture.

## 1. Introduction

Human resources in the IT field are one of the key factors in implementing IT in organizations. However, the availability of IT human resources has not been able to meet the needs and challenges of the organization in synergizing IT and business. Meanwhile, on the other hand, the qualifications of IT human resources do not meet the existing competency standards. Besides that, difficulties in finding qualified IT human resources are: (1) HR teams in multinational companies are having difficulties finding skilled IT workers; (2) Existence of talent gaps and a lack of access to professional IT workers; (3) Many IT bachelors (up to 400k people/year) graduate without sufficient industry qualifications; (4) The previous survey done by Robert Walters reported that 68% of respondents from HR said that they were having difficulties finding talents in the technology sector; (5). Studies also found that the HR team needs at least three months to find a replacement if IT staff resign. Another phenomenon related to background checks (such as on education, employment, criminality history, and reference checking) to detect fraud is that they are time-consuming and require extra effort and costs since the HR team must manually check each data source.

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Moreover, previous surveys also predicted the increasing need for a professional workforce in the information technology and communication sector (2021–2025). It can be suggested that there is a demand-supply gap in IT workforce needs. It is predicted that the demand for IT workers will increase by two times in the next five years. The number of IT workers on demand each year amounted to 200–250k people. Even though there are 400k new BScs in IT each year in Indonesia, only a few have relevant qualifications. Fewer people have IT qualifications currently in need, i.e., Software Engineer, Cloud Engineer, AI Expert. Moreover, 21.4% of Indonesian youth never attend any training/certifications, further increasing the skill gap. Previous studies show that the implementation of service-oriented architecture has become one of the most important trends in information systems and application development [1].

Besides that, the factors influencing the organizational adoption of service-oriented architectures have been discussed by Luthria & Rabhi [2]. According to Boumahdi et al. [3], the application recruitment process has been implemented using a service-oriented architecture (SOA). Besides that, the application for job seekers in Sweden based on service orientation has been introduced by Allouhaibi & Talal [4]. According to Hustad & Olsen [5], the advantages and challenges of building digital infrastructure based on a service-oriented environment have been explained. A study of the design and implementation of online learning using microservices has been proposed by Ren et al. [6]. A study investigating the issues and practices of SOA has been explained by Hamzah et al. [7]. The recent trend in Enterprise Service Bus (ESB) applications can be shown in more detail by Aziz et al. [8]. In this study, we proposed a platform system called TALENT-IT. TALENT-IT is a one-stop talent management service for IT professionals and IT-related companies in Indonesia. It allows IT professionals and HR officers to search for jobs, post job openings, search for candidates, and update/validate their CVs. Moreover, through TALENT-IT, HR officers can perform background checks and verification of candidates' qualifications and skills. It also allows IT professionals to search for and subscribe to online training and courses for upskilling purposes, whose results will be synced directly with their professional profiles on networking sites. TALENT-IT integrates with various services, applications, and platforms that can be described in Table 1:

**Table 1. Mapping of applications**

| Application Group | Description | Application Name: Examples |
|---|---|---|
| Job Market Sites | Allowing access to job postings and job applicants' data | LinkedIn Jobs, Jobstreet, Glints, Kalibrr, etc. |
| Human Resources Information Systems | allowing synchronization of job vacancies and candidates/employees' data with other data sources | SAP Success Factors, Microsoft Dynamics 365 HR, Mekari Talenta, etc. |
| Recruitment Applications | allowing access to candidates' data | Ekrut, ProProfs, Talentlytica, etc. |
| Identity Database Systems | allowing verification of candidates and employees' identities and educational backgrounds, | SIAK Online (e-KTP data), SKCK Online (crime record from the Police Database), and PDDIKTI (education record from Kemdikbud-Ristek) |
| Workflow database systems | allowing verification of candidates' and employees' employment historical data | SIAPKerja / Prakerja.go.id (Job seeker data from Kemnaker), JMO (Employment history & benefits data from BPJS TK) |
| MOOC & Training Provider | allowing verification of candidates' and employees' skill qualifications and certifications, as well as allowing employees to subscribe to IT-related training, which will be synced to their profile on professional networking sites. | Coursera, REVO, Udemy, Microsoft / Oracle Online Learning, etc. |
| Payment Gateway | allowing online payment of TALENT-IT services, | Midtrans, etc. |

Our research findings and contributions can be seen in Table 2, which is derived from research state of the art:

**Table 2. Finding Contribution and research state of the art**

| Research Topic | Services Identification | Domain & Ecosystem | SOA, ESB and Microservices | Systems Architecture | Systems Layering |
|---|---|---|---|---|---|
| Development, Service-Oriented Architecture, and Security of Blockchain Technology for Industry 4.0 IoT Application [9] | Not yet Comprehensive | Internet of Things | Yes | Yes | Yes |
| A Service-Oriented Business Collaboration Reference Architecture for Rural Business Ecosystem [10] | Comprehensive | Rural business | Yes | Yes | Yes |
| Middleware Architecture for Microservices-Based Distributed Systems [11] | Not yet Comprehensive | No | Yes | Yes | No |
| Analysis of Service-Oriented Architecture and Scrum Software Development Approach for IIoT [12] | Not yet Comprehensive | Industrial Internet of Things (IIoT) | Yes | No | No |
| System Architecture for the IT Talent Ecosystem Using a Service-Oriented Approach (our proposed) | Comprehensive | IT Talent Ecosystem | Yes | Yes | Yes |

## 2. Related Works

According to Giao et al. [13], a framework for service-oriented architecture (SOA)-based IoT application development has been implemented. Related to Rosa et al. [14], the discussion about adaptive middleware has been done. Besides that, enterprise integration using a service-oriented architecture has been proposed by Grant & Yeo [15]. The mechanism for transforming Monolithic Systems to a Microservices Architecture related to Hamza [16]. On the other hand, decomposition of Monolith Applications.

Into Microservices Architectures has been discussed by Abgaz et al. [17]. Further investigation about SOA can be explained by Niknejad et al. [18]. Service-Oriented Architecture (SOA) is a business application architecture in which business functionality, or application logic, is made available to its users as a shared service and can be reused within the scope of Information Technology. It can become one of the most important trends in Information System development [2]. According to Erl [1], SOA is a paradigm for building software architecture that defines the use of services to meet software needs in the form of architectural technology using service-oriented architecture [2]. According to Erickson & Siau [19], the critical success factors in SOA implementation should be considered. Related to MacKenzie et al. [20], the Open Group defines Service Orientation Architecture as an architectural model that supports service orientation. Besides that, the OASIS reference model states that service-oriented architecture is a paradigm that is able to manage and use distributed services in different domains that are designed and implemented in a loosely coupled manner and can be accessed on various platforms [20].

According to Reddy et al. [21], a web service is an interface service that implements the logic of a business process. It receives messages in XML from the network, converts them into a format that is understood by the software from the back-end system, and returns the message. The architecture of REST is described as where the client sends a request to the server, then the server will process the request and return the response, which is a representation of a resource consisting of a URL [22]. According to Arsanjani et al. [23], an approach to building applications based on SOA can be used with SOMA. Related to Dragoni et al. [24], explanation about yesterday, today and tomorrow about Microservices has been discussed. According to Richardson et al. [25], an API gateway is a server that is the single-entry point into the system, and it will often handle requests by implementing multiple microservices and aggregating the results. Related to Rettig et al. [26], it can translate between web protocols like HTTP and WebSocket and web protocols that are not commonly used internally. According to Levcovitz et al. [27], applications with monolithic architectural patterns will grow in size over time, making them difficult, risky, and costly to evolve. SOA implementation in enterprise systems has been discussed by Lämmer et al. [28].

Comparation analysis SOA and the rest have been proposed by Wagh & Thool [29]. According to Larrucea et al. [30], the advantage of implementing REST architecture is that the information received can be more easily read on the client application side. Software development paradigms using microservices architecture can have the capability to break down systems and applications to a more granular and modular level. According to Fersi et al. [31], middleware is a software layer between the physical layer and the application layer. Middleware provides a set of programming abstractions to facilitate the integration and communication of heterogeneous components. Besides that, a service requirement engineering method for a digital service ecosystem has been proposed by Immonen et al. [32]. A study related to microservices has been discussed by Bucchiarone et al. [33]. The implementation of microservice design has been shown in UniKnow [34]. According to Merson & Yoder [35], microservices can be modeled. The comparison performance of monolith architecture has been discussed by Barczak & Barczak [36]. Related to Smirnova [37], it shows the monolithic infrastructure.

## 3. Research Methodology

The stages in research methodology are below:

- *Analysis and Observation:* Observations in this study were carried out to determine the actual state of the object of research. Observations in this study were carried out at the level of the existing information system application architecture. From these observations, it is also known that the current information system application architecture uses a monolithic architecture;
- *Analysis from an in-depth interview:* This interview will be held where the case study is conducted, taking into account the authority and competence of the resource person. In this interview, there were two people who became resource persons;
- *System Architecture Design:* This study uses domain-driven design as a reference or guideline for designing an information system application based on a service-oriented approach such as SOA or microservices;
  - *Analysis Features of the systems:* This stage is the initial stage in designing the SOA architecture using the SOMA method, which describes the architecture and business model of the research object.
  - *Services Analysis and Identification:* This identification stage aims to determine service requirements for this architecture; it aims to align business strategies, goals, and processes with information technology execution. Identification in this study was carried out using 3 (three) techniques, namely goal-service modeling, domain decomposition, and existing asset analysis.

- *Specification of Architecture and Layering:* The specification stage is the design stage of service-oriented architecture based on the results of the previous identification. In this research, there are 2 (two) activities, namely service specification and component specification. Then, the results of this specification stage will be used to assist in decision-making at the next stage.

## 4. Results and Discussion

### 4.1. Analysis Features of the Systems

From our desktop research, we also found several other software that offers similar services that we proposed. Some are Accurate Background Check API Integration from Accurate Background (a US background check company) and XREF (an online reference checking platform). The comparison between our platform and the other services is as follows:

**Table 3. Feature Comparison Analysis**

| Features | TALENT-IT | Accurate Background Check API | XREF |
|---|---|---|---|
| Professional Network integration (Via LinkedIn) | | | |
| Job marketplace integration (TALENT-IT: via Glints, Jobstreet, LinkedIn Jobs, etc.) | | | |
| Recruitment and psychological assessment integration (TALENT-IT: via Talentlytica, Ekrut, etc.) | | | |
| ERP / HRIS integration (Via SAP, Microsoft Dynamics, etc.) | | | |
| Criminal record validation (TALENT-IT: via SKCK Online) | | | |
| Identity verification (TALENT-IT: via SIAK online) | | | |
| Education background verification (TALENT-IT: via PPDikti) | | | |
| Employment status and history verification (TALENT-IT: via SIAPKerja, Prakerja, JMO) | | | |
| International background check (sanctions, arrest warrant, terrorism, watchlists) | | | |
| Credit Financial & Business Checks | | | |
| Health / medical record check | | | |
| Courses / Training completion validation (from REVO, Coursera, Datacamp, udemy, dicoding) | | | |
| Technical certification verification (from Microsoft Learning, Oracle University, Google Certification) | | | |

From Table 3, it can be inferred that TALENT-IT services are comparable with other providers' services, which include integration with professional networking sites, recruitment software, HR information systems, criminal record databases, identity databases, education and employment databases, and online training providers.

However, TALENT-IT could not yet connect with international entities (i.e., Interpol) for international/ cross-border background checks and integrate with medical and financial records. This is because the national medical record register is non-existent in Indonesia, where each healthcare institution preserves records only for internal purposes; credit rating checks through the Financial Services Authority (OJK) can only be performed by the debtor or financial institutions for loan-related purposes. Nevertheless, TALENT-IT integrates with popular online job market sites, i.e., Jobstreet, LinkedIn Jobs, and Glints, allowing recruiters to pull candidates'/ applicants' data from the job market and perform background checks on the applicants/candidates with ease. Several use cases and benefits from TALENT-IT for three different stakeholders will be explained in Table 4:

**Table 4. TALENT-IT Stakeholders**

| | | |
|---|---|---|
| 1 | Employees/Job Seekers | • TALENT-IT can assist job seekers and employees in their job search, especially when creating their CVs and professional profiles. It is all due to the integrated background verification system, which combines several pivotal pieces of information like profiles, skills, etc. This also helps other concerned parties ease the validation process on the Job Seeker's CV.<br>• TALENT-IT also helps jobseekers search for and obtain qualified training that will be validated and integrated automatically into their CV and professional profile to boost their confidence further. |
| 2 | Human Resources Team (HR Team) | • TALENT-IT can be a one-stop service platform to help HR teams find suitable candidates for IT-related positions.<br>• HR Teams can easily access various databases that will be very useful in filtering applicants/candidates to be the right fit for the company.<br>• It will help make the background check more time-efficient and hassle-free. |
| 3 | System/Service Provider (HRIS/Service Provider, Personal Networking Sites, Recruiting Software) | • TALENT-IT can provide additional value by allowing access to and integration with relevant data sources on professional profiles and background information so that users can obtain more valid and relevant data as necessary. |

### 4.2. Services Identification

The following table lists the services offered by TALENT-IT, which are grouped into several areas as follows:

Job search and application service integrates with HR information systems (SAP, MS Dynamics), professional networking sites (LinkedIn), Job Market and Recruitment Systems (Ekrut, Jobstreet), and Workforce benefits systems (JMO, SIAPKerja). This service allows HR officers to manage vacant positions in the company, post relevant job ads, and look for suitable candidates. This also allows job seekers to search for openings. Table 5 shows the list of services:

**Table 5. Job search and application list of services**

| Service Group | Service Name | Parameter | Description | Resources |
|---|---|---|---|---|
| Job Search and Application | get_job_vacancies | jobID, jobTitle, jobDepartment, jobDescription, salaryRange, isSalaryVisible, dueDate, jobQualifications | Allow HR officer to obtain a vacant position from internal HRIS | SAP / MS Dynamics HR |
| | post_job_vacancies | jobID, jobTitle, jobDepartment, jobDescription, salaryRange, isSalaryVisible, postDate, dueDate, jobQualifications | Allow HR officer to post a job ad for the vacant position | LinkedIn, Ekrut, Jobstreet |
| | search_candidates | jobTitle, jobDepartment, jobDescription, jobQualifications, isLinkedInOpenToWork | Allow HR officers to find suitable candidates for a particular position. | LinkedIn, SIAPKerja, JMO |
| | search_job_vacancies | jobKeyword, applicantQualifications, jobLocation, jobCategory | Allow job seeker to search for vacancies | LinkedIn, Jobstreet |

- ***Background Check Service***

This service allows HR officers to obtain and verify candidates' biodata, citizenship identity, criminality data, social security status, and education history. Using this service, job seekers may also validate the authenticity of the information entered into their CVs on professional networking sites (see Table 6).

**Table 6. List of background check services**

| Service Group | Service Name | Parameter | Description | Resources |
|---|---|---|---|---|
| Background Check | get_applicant_bio | jobApplicantName, dateOfBirth, address | To get applicant biodata | LinkedIn, Ekrut, Jobstreet |
| | get_citizenship_identity | jobApplicantName, dateOfBirth, address | To get applicant citizenship data | SIAK (Sistem Informasi Adminsitrasi Kependudukan) |
| | get_criminality_data | nik, jobApplicantName, dateOfBirth | To get job applicant criminality data | SKCK Online |
| | get_social_security_data | nik, jobApplicantName, dateOfBirth | To get social security / BPJS status details | BPJS / JMO |

- ***Employment and Training Verification Service***

This service allows HR officers to obtain and verify candidates' employment and training histories. Using this service, job seekers may also validate the authenticity of the employment and training information entered into their CVs on professional networking sites (see Table 7).

**Table 7. List of employment and training verification services**

| Service Group | Service Name | Parameter | Description | Resources |
|---|---|---|---|---|
| Employment and Training Verification | get_job_applicant_history | nik, jobApplicantName, dateOfBirth | To get a job employment history | LinkedIn, Ekrut, Jobstreet |
| | verify_employment_history | nik, jobApplicantName, dateOfBirth, employmentHistory | To verify job applicant employment data | LinkedIn, SIAPKerja, JMO |
| | verify_training_history | nik, jobApplicantName, dateOfBirth, certificationId | To verify job applicant training data | LinkedIn, SIAPKerja, Training/ Certification Providers |

- ***Online Training and Seminar Registration and Certificates Validation Service***

This service allows job seekers and employees to search for and subscribe to relevant online training. The service will also sync current training progress and validate the authenticity of the training information entered into their CV on professional networking sites by using this service (see Table 8).

**Table 8. List of online training and seminar services**

| Service Group | Service Name | Parameter | Description | Resources |
|---|---|---|---|---|
| Online Training & Seminar | search_available_training | trainingProviderID, trainingProviderName, courseID, courseName, trainingFee, courseLevelID, courseLevelName, courseDuration, courseTypeID | To search for available online training | MOOC / Training providers, Prakerja.go.id |
| | view_training_details | trainingProviderID, courseID, courseLevelID, courseTypeID | To view training program details, schedule, requirements, etc. | MOOC / Training providers, Prakerja.go.id |
| | register_training | trainingProviderID, courseID, courseLevelID, courseTypeID, nik, jobApplicantName, dateOfBirth, | To allow direct registration for a training program | MOOC / Training providers, Prakerja.go.id |
| | pay_training | courseBookingID, jobApplicantName, paymentMethodID | To act as a bridge for paying training fees via payment gateways | DOKU / Midtrans API |

- ***Payment Services***

This service allows users of TALENT-IT to pay online for the services they wish to utilize. This includes paying for API access, subscription, or online course registration fees (see Table 9).

**Table 9. List of payment services**

| Service Group | Service Name | Parameter | Description | Resources |
|---|---|---|---|---|
| Payment | post_payment_data | paymentID, paymentDate, paymentAmount, paymentMethodID, paymentVerificationDetails, paymentDateTime | To allow users to submit payment details (name, card no. / account no, phone no., etc.) | DOKU / Midtrans API |
| | verify_OTP | paymentID, paymentOTP, | To verify payment requests using OTP | DOKU / Midtrans API |
| | verify_PIN | paymentID, paymentPIN | To verify payment requests using a PIN (optional) | DOKU / Midtrans API |
| | get_payment_response | paymentID, paymentStatus, paymentDateTime, errorID | To obtain transaction status | DOKU / Midtrans API |

According to Table 9, we can see the service integration mechanism using the parameters of each application involved. . It shows the exchange of data and information tailored to the needs of the parameter request.

### 4.3. SOA Architecture and SOA Layer

We proposed SOA Architecture that can be described in Figure 1:

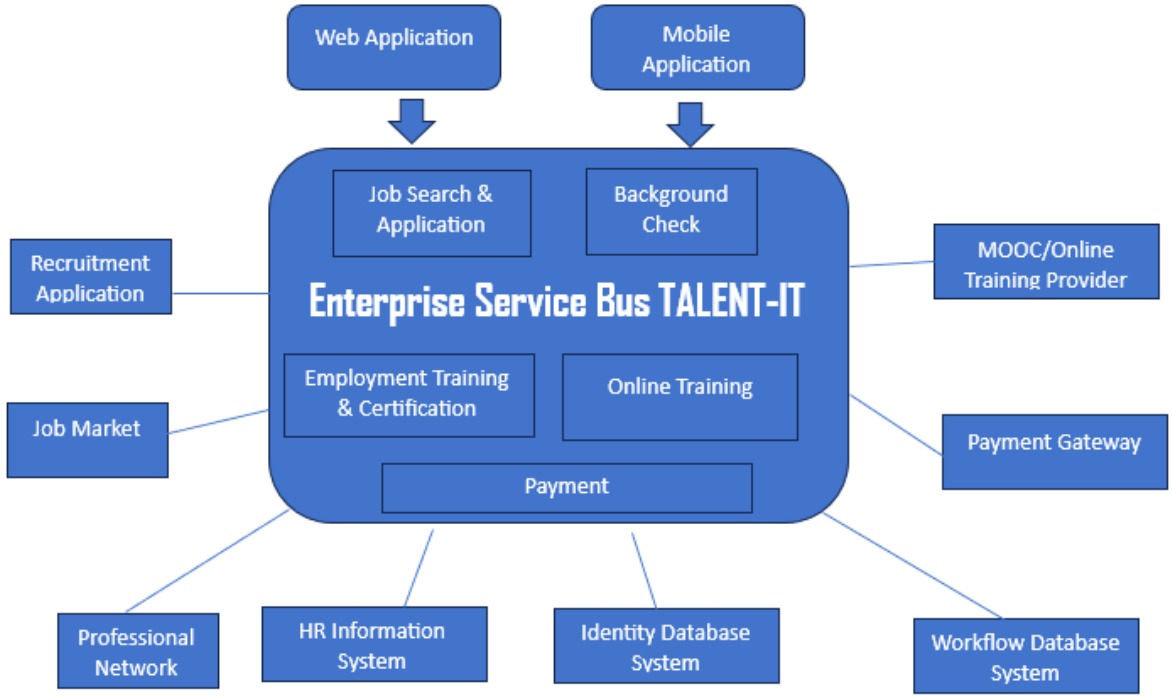


**Figure 1. SOA Architecture for Enterprise Service Bus Talent-IT**

As stated in Figure 1, TALENT-IT integrates various applications that provide services as business processes (Job Search & Application, Background Check, Employment and Training Certification, Online Training and Seminar, and Payment) using ESB. This allows TALENT-IT to transform the data models from the resources of the service providers (Professional Network/CV, Recruitment Application, Job Market, HR Information Systems, Identity Database Systems, Workforce Database Systems, MOOC/Online Training Providers, and Payment Gateways) and communicate (send requests/receive responses) with the Client (Web/Mobile) through the standard network protocol, which is SOAP/HTTP. This allows TALENT-IT to handle multiple requests by users effectively and efficiently. Then, we proposed the SOA layer for TALENT-IT ecosystems in Figure 2:


**Figure 2. SOA Layer for TALENT-IT Ecosystems**

Based on Figure 2, there are five layers of parts that build a service-oriented architecture (SOA) of TALENT-IT from top to bottom, namely the UI Layer, Business Process Layer, Service Layer, Resource Layer, and Database Layer.

1. The UI Layer is the top layer of the Talent IT SOA. This layer is responsible for displaying and receiving data from/to clients (in this case, Companies and Job Seekers).
2. The Business Process Layer is the second-topmost layer of TALENT-IT SOA. This layer is responsible for grouping each service based on its respective business processes.
3. The Service Layer is the third-topmost layer of the Talent-IT SOA. This layer consists of various services or functions connected to various applications to carry out the data exchange process.
4. The Resource Layer is the fifth-topmost layer of the Talent-IT SOA. This layer consists of every application connected to the integrator that acts as the source or destination of the data exchange process.
5. The Database Layer is the sixth topmost / the lowermost layer of the Talent-IT SOA. This layer is responsible for receiving the data in XML format and storing it in a database (SQL Server).

### 4.4. Challenges of Monetization

For the monetization possibilities for TALENT-IT, several schemes will be implemented later in the project:

1. ***Pay per click / API Hit:*** Users will need to pay an API access fee every time they perform a search, information and data checking, validation of users' CVs and backgrounds, and relevant institutional databases that assist the background checking process.
2. ***Monthly Subscription:*** For institutional and volume users, there are options for monthly and yearly subscription methods in which they can perform unlimited validation of checking applicants' personal information for background checking purposes.
3. **Commissions** from training providers for each training fee paid by the user (conversion fee).

Training providers (i.e., Coursera, Udemy, etc.) will pay us an affiliate commission fee (3%–10%) each time a user subscribes to training that is being accessed or advertised through our platform.

### 4.5. Implication and Explanation of Findings

The main finding of this research is a system architecture that provides a mechanism for integrating a number of different applications by acting as service providers and consumers services by implementing a services approach that synergizes SOA and microservices. It is different from other studies, which are only doing partially and not comprehensive integration mechanisms and service identification.

## 5. Conclusion

Limited IT employment opportunities have an impact on increasing unemployment rates. This is a concern for IT workforce users, IT workforce producers, and ecosystem actors involved in the IT Talent ecosystem. Meanwhile, from the perspective of IT graduate users, readiness to work in fields that are appropriate and relevant to the field of science is an important factor. This condition further widens the gap between industry and higher education institutions. The ability to integrate all IT Talent ecosystems can help IT graduates be absorbed into the world of work quickly, easily, and flexibly. Therefore, integration involves all ecosystems in one enterprise service bus platform, which acts as middleware in providing services that are reusable and can be accessed by various applications. TALENT-IT is a platform that can act as a service bus for the IT Talent Ecosystem. It can be developed using a service-oriented approach to handle the limitations of agility and flexibility in dynamic business changes. It can be shown as a platform gateway to integrate more entities into the IT Talent ecosystem. It can provide a message exchange for data and information.

### 5.1. Strengths and Limitations

The strength of this research is that the proposed integrated TALETN-IT Platform System Architecture has the ability to comprehensively integrate IT Talent Ecosystem actors. This is reflected in the list of services that can be used by applications on various platforms. Meanwhile, the TALENT-IT system layering uses a mechanism for reusing business services that are broken down from business processes. The limitation of this research is that the evaluation and testing of the TALENT-IT system have not been carried out by experimenting with a number of domains and users.

## 6. Declarations

### 6.1. Author Contributions

Conceptualization, A.N.F., A.E.K., and J.J.H.; methodology, A.N.F.; software, S.L. and F.P.; validation, S.L., and A.N.F.; formal analysis, A.N.F. and A.E.K.; investigation, J.J.H.; resources, F.P.; data curation, S.L. and F.P.; writing—original draft preparation, A.N.F. and A.E.K.; writing—review and editing, A.N.F. and J.J.H.; visualization, S.L.; supervision, A.N.F.; project administration, F.P.; funding acquisition, A.N.F. All authors have read and agreed to the published version of the manuscript.

### 6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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### 6.4. Institutional Review Board Statement

Not applicable.

### 6.5. Informed Consent Statement

Not applicable.

### 6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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