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INTEGRATION STRATEGY FOR PUBLIC SERVICE APPLICATIONS BASED ON WEB SERVICES (CASE STUDY: BPOM AND MINISTRY OF HEALTH)

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ABSTRACT

Developing Web Service Based Public Service Application Integration is a Strategic Program of the POM Agency and the Ministry of Health in Accelerating Public Services to the Community, in the context of automating the delivery of data. Issuing Supervision Result Analysis Certificates (AHP) with Narcotics, Psychotropics and Precursor commodities (POM Agency) to the Ministry of Health to fulfill data needs in the import and export licensing services for Narcotics, Psychotropics and Pharmaceutical Precursors for business actors. The total number of AHP document requests (2021) was 730 documents and 615 documents were approved from Import and Export service performance data (SLA 2021). Web Service is software used in the data exchange process. The integration strategy carried out is to carry out comparative studies and analysis by conducting tests to determine which Web Service suits the application service needs, be it SOAP or REST. Based on previous research conducted by Potti (2011) regarding SOAP Versus REST Web service design that understanding REST is easier and easier to learn, in this research the response time of REST is better and faster than SOAP which is much more secure. Other research on RESFUL Web Service Implementation Using Spring Framework in Room Assets management system, by implementing RESTFULL space management can be accessed from various platforms, helping users borrow space. the data received is appropriate, valid and accurate with that in the database (S.Achsan 2022: 8). The final objective of this research is to conduct a comparative study and analysis to determine the appropriate web service, either SOAP or REST, by conducting local testing, to then be used in integrating the Ministry of Health's Monitoring Results Analysis Certificate (AHP)-NPP data safely, quickly and efficiently. from an SLA of 3 working days to 1-2 working days.

KEYWORDS Narcotics, Psychotropics, Precursors, REST, SOAP, Web Services.

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INTRODUCTION

The import and export of Narcotics, Psychotropic Substances, and Pharmaceutical Precursors are strictly regulated by the government in order to maintain public safety and health. To submit an application for Analysis of Supervision Results (AHP) by accessing the official portal address https://e-napza.pom.go.id in accordance with the provisions in BPOM Regulation No. 26 of 2020, KEMKES Regulation No. 10 of 2013, and Presidential Regulation No. 28 of 2023. The required documents : pharmaceutical industry license, pharmaceutical wholesaler license and or science institution license, tax identification number, special importer license for state-owned PBF companies, license as a Psychotropic Producer Importer (IP) and or license as a Pharmaceutical Precursor Producer Importer (IP), permit as a Limited Importer (IT) Psychotropic and or permit as a Limited Importer (IT) Pharmaceutical Precursors, permit as a Producer Exporter (EP) Psychotropic and or permit as a Producer Exporter (EP) Precursors, permit as a Limited Exporter (ET) Psychotropic and or permit as a Limited Exporter (ET) Pharmaceutical Precursors. At the evaluation stage of the documents, the time period required is 3 to 4 working days after the applicant makes a non-tax state revenue (PNBP) payment. This provision is based on the regulation of the Food and Drug Administration (BPOM 2020: 26) article (8) concerning evaluation of applications and issuance of decisions or *Service Level Agreement* (SLA).

The Food and Drug Administration issues a decision on the evaluation results in the form of a certificate of approval in *hard copy*. The evaluator downloads the document for endorsement by providing an approval stamp and uploads it back into the system. Then, the Pharmaceutical Industry or pharmaceutical wholesaler will retrieve the approval certificate file at the POM in *hardcopy* form to be followed by re-entry of the Supervision Result Analysis document in the Ministry of Health Public service application through https://e-pharm.kemkes.go.id as a document and data requirement for the issuance of NPP Import and Export certificates.

The total AHP document requests in 2021 were 733 documents and 615 documents were approved with the following details: three working days 565 documents, four working days 48 documents, and 2 rejected documents from the Import and Export service performance data (SLA 2021). Alas MS, *et al.* (2024) revealed that the REST *Web Service* provides the most optimal performance results, such as the duration of transaction time from sending data by the client to the response back from the server. Chang CE (2022) emphasized the superiority of REST over SOAP in data transmission using reconfigurable computing. This paves the way for the adoption of low-cost systems such as home appliance web services.

This research aims to analyze the comparison between SOAP and REST *Web Service* testing and integrate data transmission of AHP public service applications to the Narcotics, Psychotropic and Precursor Import Export Licensing (e-pharm) quickly, safely, and efficiently.

RESEARCH METHOD

System Development Method

The Waterfall model was first introduced by (Winston Royce 1970) and developed by (Pressman 2001) as a model in building information systems. This research uses the Waterfall model to conduct application development. This model approach is similar to a waterfall that flows downward and consists of five to seven stages or phases. The overall stages describe the information system development life cycle as shown in Figure 1.

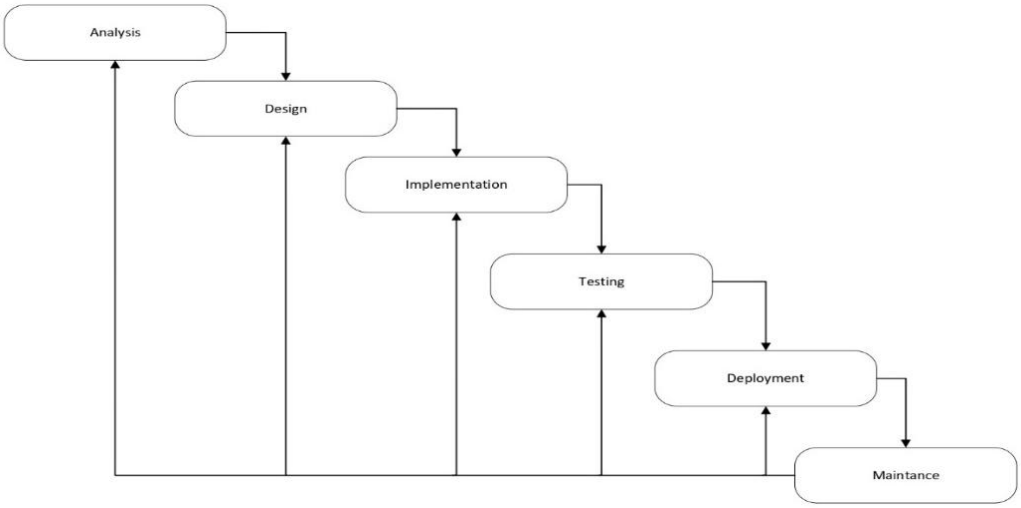


Figure 1 *Waterlfall* Development Model (source: Pressman 2001)

System analysis is the earliest stage in system development (Pressman 2001). This stage determines how successful the information system will be such as identifying problems, analyzing system needs, and conducting a study of application innovations that have been implemented in application services. Design is the process of making or developing concepts such as designing a database and designing a *Web Service* application integration guide (PIA). Implementation is the stage where the entire design or design is converted into program codes that can be understood by computers, determining the scope of the developer, and compiling programming code using the PHP language and CodeIgniter framework. Evaluation or testing is the stage of testing the system using the SOAP and REST methods as a *Web Service* that will be used for application integration, compiling functional testing scenarios and performance testing as a guide in conducting tests. *Deploy* or *deployment* is the process of moving the application, installation, and operation of the system in the production environment. And *Maintenance* is an ongoing process such as software maintenance or server maintenance.

RESULT AND DISCUSSION

Analysis

The business process of issuing AHP-NPP import and export certificates before integration is first, the recommendation or director level approves the submission document and sends it to the examiner to print the AHP-NPP document. Second, the examiner prints the approval document and gives the POM Agency stamp then uploads it back to the enapza system. Third, the enapza system provides a document approval notification to the business actor's account page. Finally, the business actor takes the AHP-NPP certificate document to the POM office. The business process of issuing AHP-NPP import and export certificates after integration is a recommendation or director level approving AHP-NPP documents and automatically sent to the ministry of health application. As shown in Figure 2.

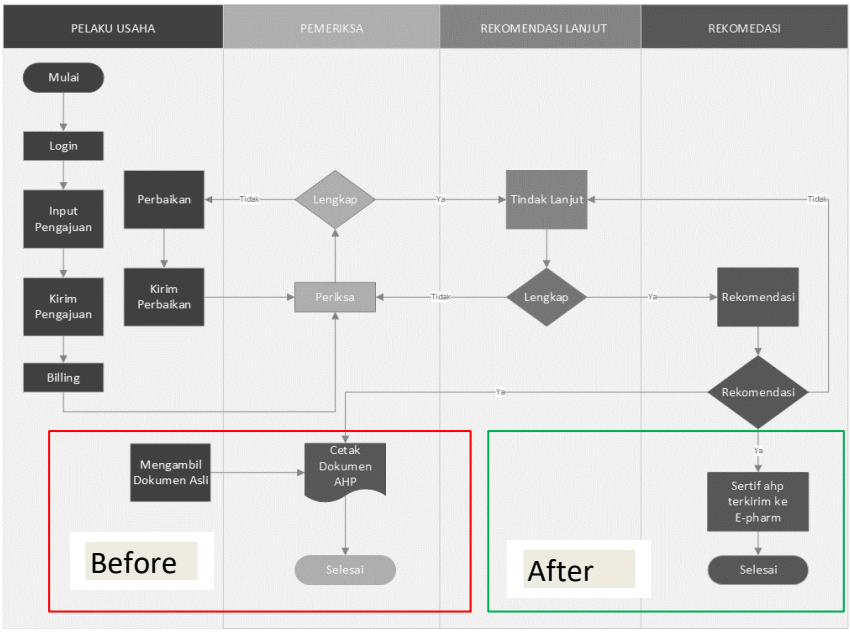


Figure 2 Process Diagram Before and After Integration

Design

Deddy Acbar Rianto, *et al*. (2018: 5) in the Scientific Journal of Media SISFO Vol.9, design is a plan for making a system with various components that will produce a system from the system analysis stage. Berto Nadeak, *et al*. (2016: 54) in the Journal of Computer Research Vol.3 No.4, design is the first step in system engineering construction. Design is the process of applying various techniques and principles to define a process or system in detail. The design in this study includes the following things:

1. Database design

   Database design is a collection of data stored in a computer which is connected to one another (Ahmad *et al*. 2018). Database is a structured data

storage area with the aim that it can be accessed quickly and easily. XAMPP and phpMYAdmin act as the parent database and application developer. There are four tables that are connected in the delivery of AHP Narcotics, Psychotropic and Pharmaceutical Precursors data. First, the import application table that holds data on submission of Narcotics, Psychotropic and Precursor imports. Second, the export application table that holds export data of Psychotropic and Precursor. Third, the AHP issuance table is a table that holds AHP certificate data on imports and exports of Narcotics, Psychotropic Substances, and Precursors. And the fourth, the AHP send log table as a table that serves to accommodate data that has been sent to the Ministry of Health's https://e-pahram.kemkes.go.id application. As seen in Figure 3.

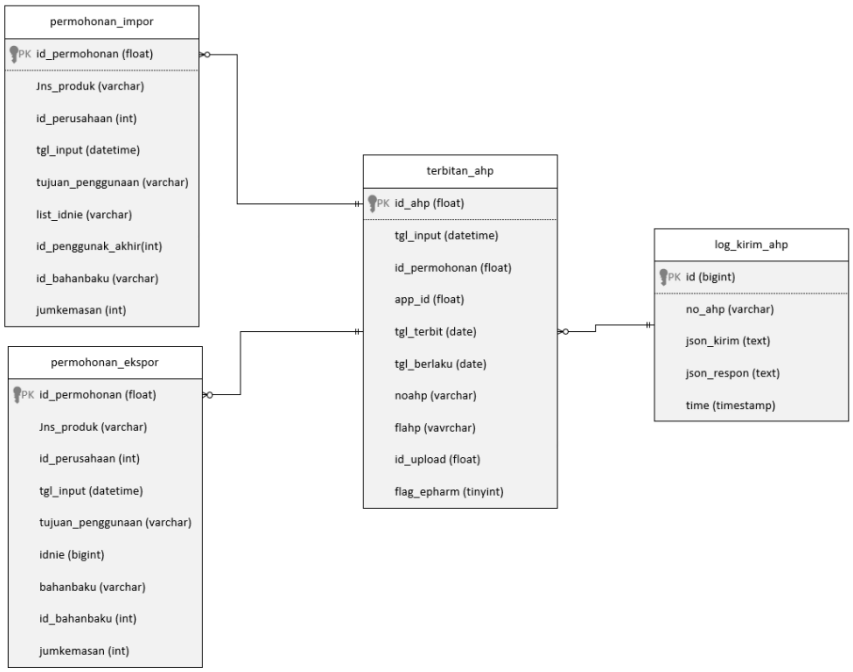


Figure 3 Import and Export AHP Cut Diagram

2. Integration design

2.1 General Conditions of Integarsi

The general provisions of integration are carried out as an effort to facilitate researchers in compiling, testing, and implementing web services in public service applications. Determine the type of *Web Service*, *end point* and data format as format to send AHP data on NPP imports and exports. As seen in Table 1.

Table 1 General Provisions

Types of *Web Service*	REST and SOAP

End Point	http:localhost/ahp/
Format	Json or XML

2.2 SOAP and REST *Web Service* Integration Guide

PIA was prepared jointly with the Ministry of Health development team in order to serve as a reference in the implementation of program code preparation in each *Web Service* such as determining the name of the *method*, *method type*, determining parameters and *response messages*. As seen in Table 2.

Table 2 Import certificate data submission snippet

Method Name	**Method Type**	**Function**	**Parameters**	**Description**
Import certificate data submission	POST	Delivery of Supervision Result Analysis approval data	Password	Provided by Food and Drug Administration
			Format	JSON
Message response	**Field**	**Definition**		**Description**
	Commodity_id	Narcotics Psychotropic Precursors		Commodity Type
	Type_approval	SPI		Import Approval Certificate
	No_ahp			Import certificate number of Analysis of Surveillance Results (AHP) Narcotics, Psychotropic and Precursors

Implementation

According to Nurdin Usman (2005:70), implementation is a planned action based on the mechanism of a system. Implementation is the process of integrating technology or information systems to improve efficiency, effectiveness, and operational performance. The implementation steps taken by researchers in this study are as follows:

1. Scope of Development

   The hardware used in this research is as follows:

   a. Intel Corei5-2430M Processor
   b. 8GB Ram
   c. 1 TB SSD

The software used is as follows:

a. Windows server 2016
b. PHP Programming Language
c. Sublime Text
d. MySQL
e. Postman
f. SOAPUI
g. JMeter

2. API Coding

The programming used in developing integration in this research is a back-end system using the Hypertext Preprocessor (PHP) programming language and the CodeIgneter framework.

Evaluation

According to Hakam (2016), the evaluation of an information system is a stage to determine the extent of the progress of the steps taken in the system implementation stage, both from the user's point of view and from the point of view of the information technology system. System evaluation involves various stages to ensure the system operates according to the web service integration development plan, including Simple Object Access Protocol (SOAP) and Representational State Transfer (REST). The evaluation process can be divided into two stages:

1. Test Scenario

The test scenario in this study aims to describe the steps that will be taken in conducting the test, among others:

a. Functional Testing Scenario
   1) Testing the consistency between sent and received data
   2) Comparing data delivery response time between REST and SOAP Web Service.
b. Performance Testing Scenario
   1) Performance testing on the login page.
   2) Performance testing on the NPP import application page
   3) Performance testing on the NPP export application page

2. Functional Testing

Functional testing is done as an evaluation step to see the performance of each *Web Service*, both REST performance and SOAP performance. REST testing is done using Postman software. Postman is software for testing, developing, documenting and monitoring *Application Programming Interface* (API). While testing on SOAP uses the help of SoapUI software, which is *open source* software used for testing *Web Service services.* In this test, requests are made to the *Web Service server* and create test criteria, such as time limits, security or validation.

2.1 Import Data Consistency Testing REST

2.1.1 Narcotics

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on narcotics import commodities with AHP number **T-PW.03.04.3.352.02.20.A066**. As shown in the following JSON data snippet:


```
 {
 "dataAHP": {
  "KOMODITI_ID": "narcotics",
   "TYPE_APPROVAL": "spi",
    "NO_AHP": "T-PW.03.04.3.352.02.20.A066",
     "TGL_TERBIT": "2020-02-20",
     "END_DATE": "2020-08-20",
         }
     }start send data<br>Successful Send 1 of 1<br>end of send data
```


2.1.2 Psychotropic

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on imported Psychotropic commodities with AHP number T-PW.04.04.3.352.0.20.A143. As shown in the following JSON data snippet:


```
 {
  "dataAHP": {
     "COMMODITIES_ID": "psychotropic",
     "TYPE_APPROVAL": "spi",
     "NO_AHP": "T-PW.04.04.3.352.0.20.A143",
     "TGL_TERBIT": "2020-03-11",
     "END_DATE": "2020-09-11",
       }
}start send data<br>Successful Send 1 of 1<br>end of send data
```


2.1.3 Precursors

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on imported commodity Precursors with AHP number T-PW.05.04.3.352.03.20.A142. As shown in the following JSON data snippet:


```
{
  "dataAHP": {
     "COMMODITIES_ID": "precursor",
     "TYPE_APPROVAL": "spi",
```

```
      "NO_AHP": "T-PW.05.04.3.352.03.20.A142",
      "TGL_TERBIT": "2020-03-11",
      "END_DATE": "2020-09-11",
        }
}start send data< br> Successfully Send 1 of 1< br> end of send data
```


2.2 Export data consistency testing REST

2.2.1 Psychotropic

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on Psychotropic export commodities with AHP number T-PW.04.04.3.352.01.20.A003. As shown in the following JSON data snippet:


```
{
  "dataAHP": {
    "COMMODITIES_ID": "psychotropic",
    "TYPE_APPROVAL": "spe",
    "NO_AHP": "T-PW.04.04.3.352.01.20.A003",
    "TGL_TERBIT": "2020-01-21",
    "END_DATE": "2020-07-21",
      }
}start send data<br>Successful Send 1 of 1<br>end of send data
```


2.2.2 Precursors

The results of functional testing of *Web Service* REST sending AHP data using the POST method on export commodities Precursors with AHP number T-PW.05.04.3.352.01.20.A004. As shown in the following JSON data snippet:


```
{
  "dataAHP": {
    "COMMODITIES_ID": "precursor",
    "TYPE_APPROVAL": "spe",
    "NO_AHP": "T-PW.05.04.3.352.01.20.A004",
    "TGL_TERBIT": "2020-01-21",
    "END_DATE": "2020-07-21",
  }
}start send data<br>Successful Send 1 of 1< br> end of send data
```


2.3 Simple Object Access Protocol (SOAP)

SOAP web service testing is done using the POST method for import and export commodities. The data sent and received has no changes to the Psychotropicda and Precursor AHP certificate document.

2.3.1 Import Data Consistency Testing

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on Psychotropic export commodities with AHP number T-PW.04.04.3.353.05.23.SIT. As shown in the following XML data snippet:

```
<xml>
  <KOMODITI_ID>20240305131000000930551444</KOMODITI
_ID>
  < TYPE_PERSETUANCE>spi</JENUARY_PERSETUANCE>
  <NO_AHP>T-PW.04.04.3.353.05.23.SIT</NO_AHP>
  <TGL_TERBIT>20240626</TGL_TERBIT>
  <TGL_AKHIR>20241226</TGL_AKHIR>
  </xml>
```

2.3.2 Export Data Consistency Testing

The results of functional testing of *Web Service* REST AHP data delivery using the POST method on Precursor export commodities with AHP number T-PW.04.04.3.353.05.24.SIT. As shown in the following XML data snippet:

```
<xml>
  <KOMODITI_ID>20240305131000000930551444</KOMODITI
_ID>
  <TYPE_PERSETUANCE>spe</TYPE_PERSETUANCE>
  <NO_AHP>T-PW.04.04.3.353.05.24.SIT</NO_AHP>
  <TGL_TERBIT>20240626</TGL_TERBIT>
  <TGL_AKHIR>20241226</TGL_AKHIR>
  </xml>
```

3. Performance Testing

In this study, researchers conducted performance testing using JMeter software to evaluate application loads. Testing was carried out on a local server with the VPS15 server type, using Windows Server 2016 as the operating system, and Apache for the web service.

3.1 Login Page Test

Performance testing on the login page as shown in Table 3.

Table 3. Login Page Test Criteria

Thread Group

Number Of Threads (User)	2000-25000
Ram-Up Period (in seconds)	1
Loop Count	1
Http Request	
Name	Login page
Server Name or IP	Localhost
Http Request	GET
Path	http://localhost/execlogin.php
Parameters	
Username	Tes165
Password	Tes165

3.2 Import Submission Performance Test

Performance testing on the import submission page as shown in Table 4.

Table 4. Import Submission Performance Test

Thread Group	
Number Of Threads (User)	2000-25000
Ram-Up Period (in seconds)	1
Loop Count	1
Http Request	
Name	Import Filing Performance Test
Server Name or IP	Localhost
Http Request	GET
Path	http://localhost/pengajuanImpor.php
Parameters	
Username	Tes165
Password	Tes165

3.3 Export Submission Performance Test

Performance testing on the export submission page as shown in Table 5.

Table 5. Export Submission Performance Test

Thread Group	
Number Of Threads (User)	2000-25000
Ram-Up Period (in seconds)	1
Loop Count	1
Http Request	
Name	Export Filing Performance Test
Server Name or IP	Localhost
Http Request	GET
Path	http://localhost/pengajuanEkspor.php

Parameters	
Username	Tes165
Password	Tes165

4. Functional Testing Results Comparison

4.1 REST Web Service Functional Testing

Using Postman as testing software for each import and export commodity, the POST method to send data to the server, with JavaScript Object Notation (JSON) as the data exchange format. The document certificate was successfully sent, with the fastest response time of 340 ms.

4.2 SOAP Functional Testing

Using SoapUI as the testing software for each import and export commodity, the POST method was applied for sending data to the server, with JSON as the data exchange format. The document certificates were successfully sent, with the fastest response time of 486 ms.

5. Performance Testing Results Comparison

Performance testing was performed on a local server using JMeter software, describing user access to the public service application http://e-napza.pom.go.id with 2000 users and simultaneous access within 1 second. The summary report shows a 0% error rate indicating that all users successfully accessed the system, as shown in Table 5.

Table 5. *Summary Report* Login page

Label	Samples	Average	Error %	Throughput	Sent KB/sec
Login page	2000	34	0.00%	406.1/sec	50.76
Total	2000	34	0.00%	406.1/sec	50.76

Performance testing on a local server with 2500 users and simultaneous access within 1 second shows a summary report with an error rate indicating that not all users successfully accessed the system, as shown in Table 6.

Table 6. *Summary Report* failed Login page

Label	Samples	Average	Error %	Throughput	Sent KB/sec
Login page	2500	1012	31.28	912.1/sec	78.52
Total	2500	1012	31.28	912.1/sec	78.52

6. Output Performance Timeline

The output of the AHP issuance performance timeline in 2023 based on the monitoring and evaluation of the Directorate of Drug Control, Safety, Quality, and Export Import Supervision of Drugs in 2023 is as follows:

6.1 Number of Supervision Result Analysis (AHP) Requests in 2021-2023

In the last 3 (three) years, the number of AHPs completed and the number of AHPs completed on time have continued to increase. The increase in the percentage of AHPs completed on time in 2023 against 2021 is 2.78% while the percentage of AHPs completed on time in 2023 against 2022 is 2.49%. Table 7.

Table 7. Number of AHP Requests Completed in the Last 3 Years

Year	Number of AHPs completed	Number of AHPs on Time(1-3)HK	AHP Percentage on Time (%)
2021	684	622	90,93
2022	683	623	91,22
2023	**763**	**715**	**93,71**

6.2 Average AHP in 2023

The average number of AHPs completed each month in 2023 is 63 AHPs/month. The number of AHPs completed each month in 2023. As shown in Figure 4.

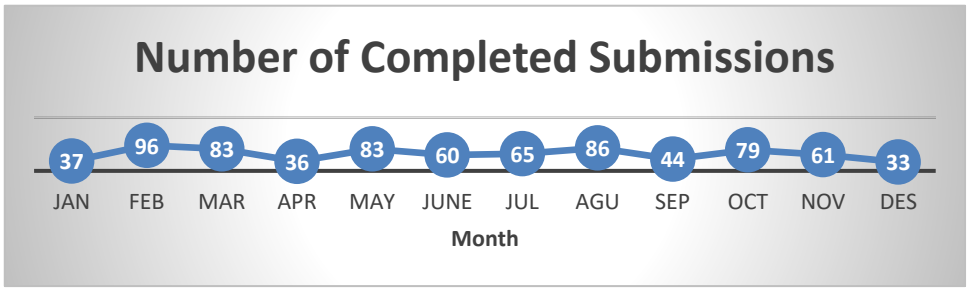
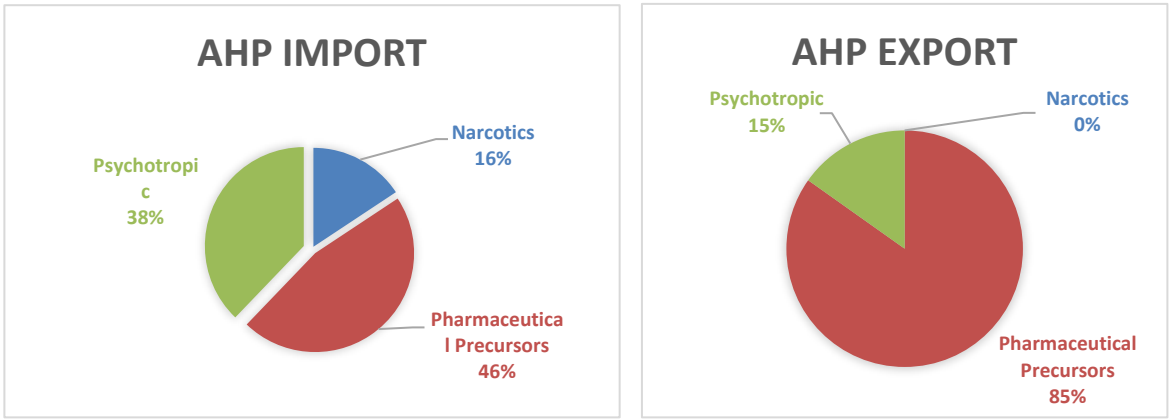


Figure 4. Monthly Completed AHP Requests in 2023

6.3 Percentage of Completed AHP Requests by Commodity Type



Percentage of Completed AHP Requests by Commodity Type

a. Import AHP

Pharmaceutical precursor imports have the highest percentage of 46% or 231 requests out of a total of 497 requests. As shown in Figure 5.

b. Export AHP

AHP pharmaceutical precursor exports have the highest number of requests at 85% or 229 requests out of a total of 270 requests. As shown in Figure 5.

CONCLUSION

From this research it can be concluded that the results of functional testing of the REST web service with the fastest data transmission time of 203 (ms) while the SOAP web service with the fastest time of 340 (ms). AHP Integration development can be implemented using REST *Web Service*.

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