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**Singapore's Producer Price Indices E-Survey System (PIES)**

for

Cross-cutting topic (1) – New methods and challenges employed by NSOs post-pandemic to collect data “electronically” in lieu of in-person

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# Singapore’s Producer Price Indices E-Survey System (PIES)

for

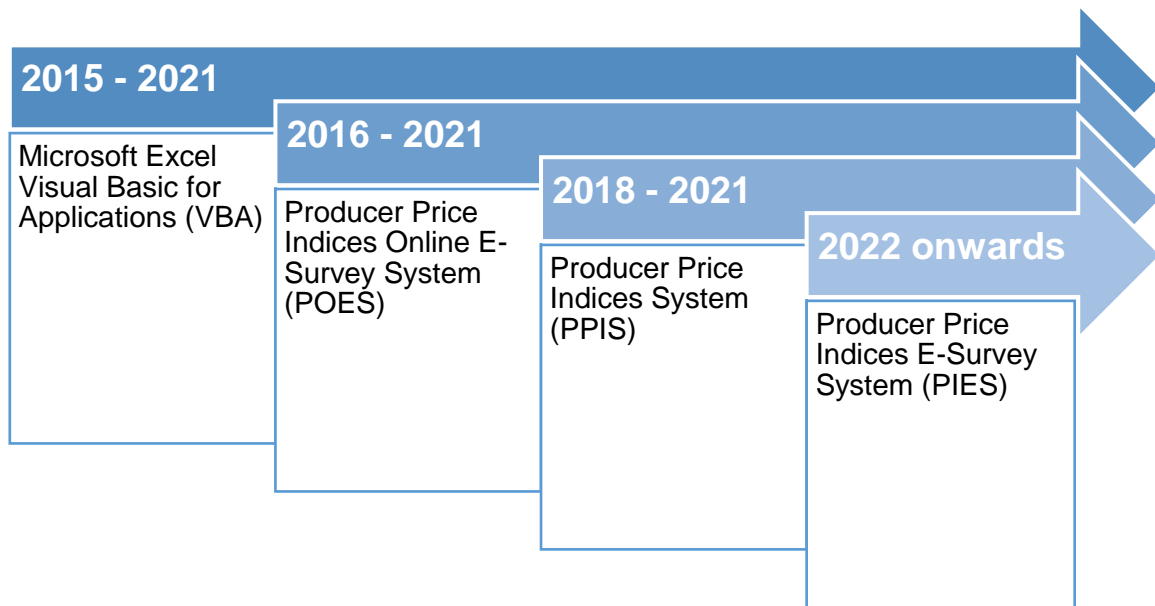
Cross-cutting topic (1) – New methods and challenges employed by NSOs post-pandemic to collect data “electronically” in lieu of in-person

## I INTRODUCTION

The Singapore Department of Statistics (DOS) has been compiling the International Trade and Producer Price Indices (PPI) for Goods since 1974, whereas the compilation of Services Producer Price Indices (SPPIs) began in 2007.

As part of DOS’s digital transformation, we are constantly adopting and implementing digital technology to facilitate the compilation of the various price indices. Over the course of time, our operations have been supported by the following software and systems as displayed in Figure 1.

**Figure 1: Timeline of Software and Systems Used**



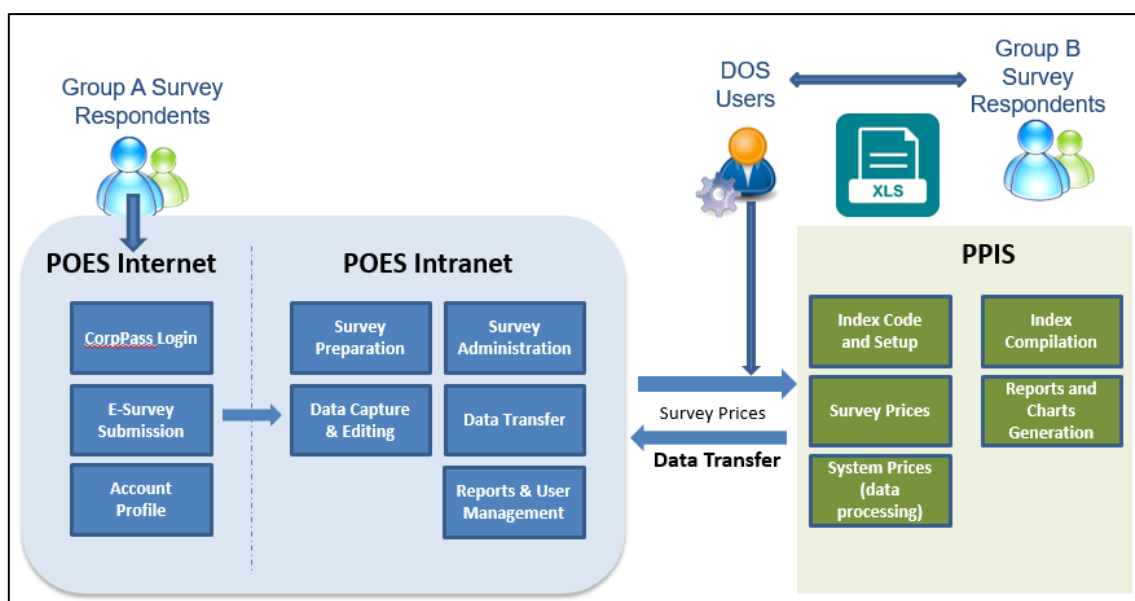
This paper summarises Singapore’s experience in developing PIES, which is an integrated system for data collection, data processing and index compilation. The planning of PIES began in 2019, before the COVID-19 pandemic accelerated the development of PIES to allow survey respondents to submit their survey returns “paperlessly”. The system went live on January 2022.

## II SURVEY PROCESSES BEFORE COVID-19 PANDEMIC

### Overview of Producer Price Indices Online E-Survey System (POES)

POES was developed to facilitate data collection from survey respondents. It allowed officers from DOS to generate survey forms to be sent via email and conduct surveys online. Our survey respondents could choose to provide their data by replying to the email with the completed survey form or submit their responses in POES. There were also in-built validation checks to ensure the data entered by our respondents were sensible. After which, the data collected would be transferred to the PPIS for data processing and index compilation. Figure 2 illustrates the survey process before the commencement of PIES.

**Figure 2: Survey Processes before PIES**



### Overview of Producer Price Indices System (PPIS)

PPIS was a separate system to facilitate data processing and index compilation. It enabled officers from DOS to compile producer price indices based on the defined index structure using the selected index formula. Moreover, DOS officers could carry out price imputations such as carrying forward previous month's prices or applying a weighted average price change of a group of linked items within the price index.

### Limitations of POES and PPIS

While POES and PPIS brought about several advantages to DOS's work processes, it was not efficient and cost effective due to the following factors.

As POES and PPIS were 2 separate systems developed by different vendors, resources were expended to ensure smooth communication between both systems. For example, the output files produced by POES had to be modified to meet the input requirements of PPIS to be transferred and uploaded successfully. DOS officers must also take the additional step to

verify the accuracy of data transfers between both systems. Furthermore, additional costs were incurred to host and maintain 2 systems, as well as to manage 2 different vendors.

The modules within POES were also hard coded to collect the relevant data items of the respective price indices for the specified base year. Hence, the survey forms generated by POES were not customisable to incorporate any new data items to reflect relevant changes in the industry. The lack of any customisability also resulted in costs incurred as the vendor of POES had to create bespoke modules to meet the requirements of newly developed or rebased price indices.

As a stop-gap solution to facilitate the data collection process for newly developed and rebased price indices, DOS officers wrote Visual Basic for Applications (VBA) Macros using Microsoft Excel to generate the customised survey forms externally from POES. While it was more cost effective to write VBA Macros than to engage the vendor to create bespoke modules, significant manual effort was still required by DOS officers to actively manage and debug the codes for the respective price indices. Furthermore, the data transfer issue caused by managing 2 separate databases persisted as DOS officers were required to continue preparing the output files to be uploaded into PPIS.

### **III DEVELOPMENT OF PIES**

Considering the limitations of POES and PPIS, and the accelerated digitalisation exacerbated by the COVID-19 pandemic, DOS initiated the development of PIES. PIES is an amalgamation of the existing PPIS with the data collection features of POES. It is an integrated system whereby data collection, data processing and index compilation can be conducted on a single platform.

#### **Initial Fact Finding**

In 2020, multiple meetings were held between DOS officers and the vendor for the latter to understand the constraints of the current systems (i.e., POES and PPIS). Thereafter, the vendor consolidated the requirements by DOS officers and proposed a list of enhancements to be implemented as part of PIES. These enhancements would allow for customisability and scalability to meet the needs of existing and new price indices, as well as to streamline work processes from data collection to index compilation.

#### **System Design and Planning**

Two sessions of Usability Interview and Workshop were conducted before the new e-survey modules within PIES were developed. The aim of the workshop was to gather feedback from the survey respondents' perspective to improve the concept design and information architecture of PIES e-survey interface for Desktop and Mobile sites.

The first session involved participants from DOS who preferably had experience in handling survey respondents and/or managing e-survey systems. It focused on the following areas:

1. To gather feedback on the advantages and drawbacks while using POES;
2. To gather comments from participants regarding their first impression of the PIES e-survey concept design and the wireframe of the e-survey webpage; and
3. To participate in a closed card sorting activity to assess the category structure of the e-survey webpage.

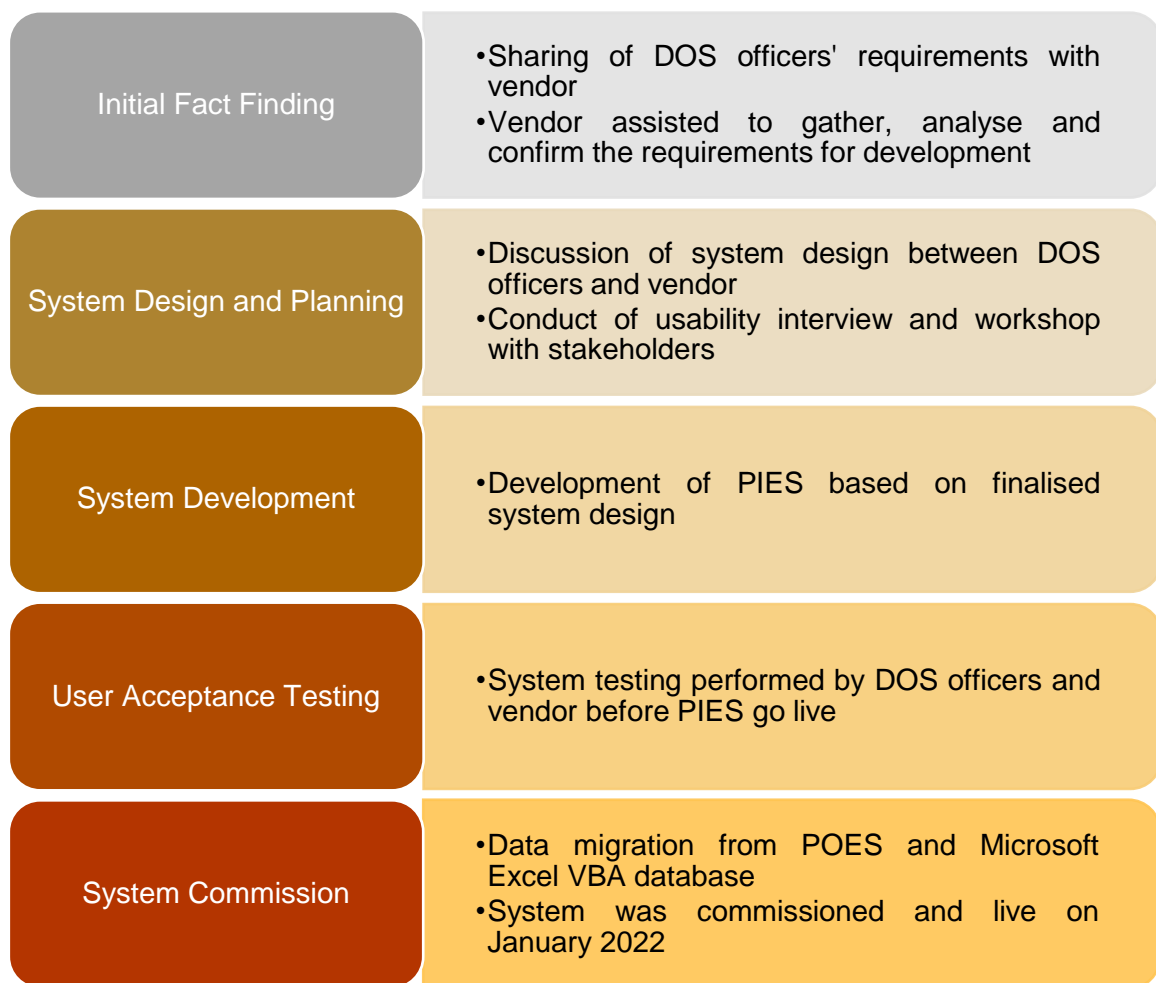
The second session involved participants who were existing survey respondents that volunteered to take part in the user experience design. A usability test was conducted, where the participants were introduced to eye tracking and hands-on experiences on the PIES e-survey interface. Subsequently, a follow-up interview was arranged with the participants to enquire on the usability of each webpage and to suggest improvements. This allowed DOS officers and the vendor to understand how the participants visually interacted with PIES e-survey interface design and whether it addressed the common navigation problems faced.

### System Development & User Acceptance Testing

After incorporating the feedback and comments received from the Usability Interview and Workshop, the design specifications were finalised and the vendor proceeded with the development of PIES.

Upon completion of PIES development, both DOS officers and the vendor conducted a thorough user acceptance testing (UAT) to ensure that all functional specifications of PIES were met. Once all test scenarios were validated, PIES went live on January 2022. Figure 3 below provides an overview of PIES development across the various stages.

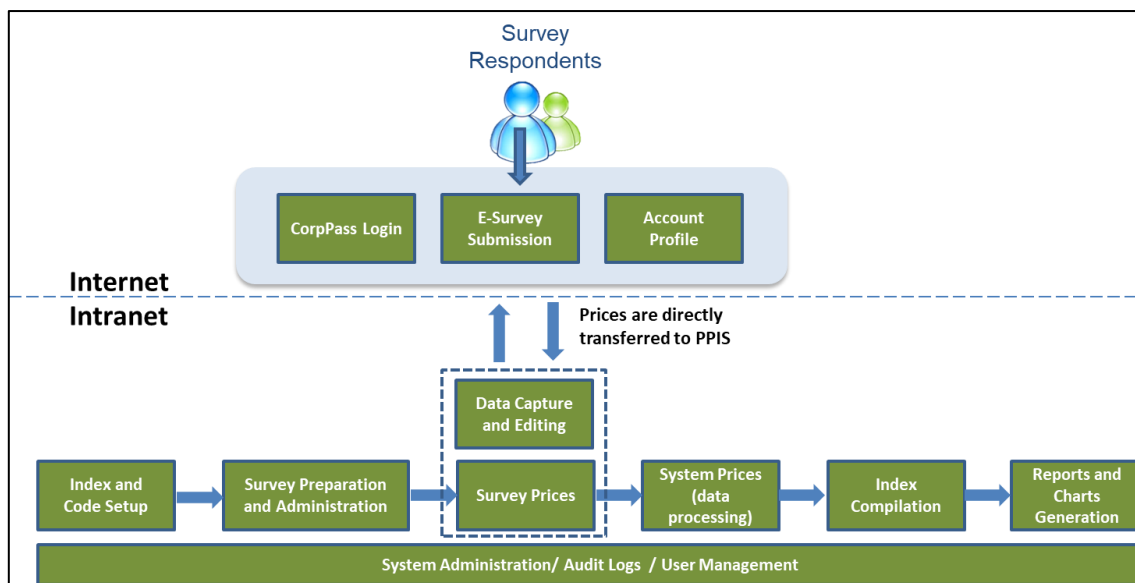
**Figure 3: Flowchart of PIES Development**



#### IV SURVEY PROCESSES AFTER COVID-19 PANDEMIC

To date, PIES has generated significant benefits and addressed most of the limitations of POES and PPIS. It has streamlined the entire process by integrating the data collection functions with the existing data processing and index compilation functions. It is also more cost effective and saves resources by removing the need to manage 2 different systems and vendors. Data accuracy have also improved as DOS officers no longer need to modify the output and input files, which will be prone to human error. Figure 4 depicts the integrated work process following the implementation of PIES.

**Figure 4: Survey Processes with PIES**



The noteworthy features that made PIES such an innovation are highlighted below:

#### **Customisation of Survey Form Design**

As compared to POES, where the modules were hard coded, PIES was built to be customisable and scalable. The latter allows DOS officers, instead of the vendor, to design bespoke survey forms that cater to the needs of the respective price indices and base years. Thus, this eliminated unnecessary costs incurred to develop new prices indices or to rebase existing price indices.

The Survey Item Format page allows DOS officers to configure the survey form based on the specifications of the item. As shown in Figure 5 below, DOS officers can choose to display the Remarks or the Unit of Measurement (UOM) column in the specified survey form.

**Figure 5: PIES Survey Item Format Screen**

**View Survey Item Format**

Survey Item Format Id: 196  
 Index Series: 201 - Sea Freight Transport Price Index (SFTPI) Base Period: 2022 (Jan 2022 - Dec 2022)  
 Survey Item Format Name: Liner (Europe) Active: Yes

**Survey Item Format**

Index Name Display: <b>Container Liner Service (Asia - Europe)</b><b> <<Item Code>></b>  
 Price Columns Heading: -  
 Price Component Name Display: <<Price Component Name>>  
 Component Input Name Display: <<Component Input Name>>  
 Currency/UCM Display: One setting across all periods  
 Item Grouping in Price Table: Every Item in Separate Price Table No. of Price Table Before Pagebreak: 1  
 Display Period Columns Heading: Yes Display Currency Column: Yes  
 Display UOM Column: Yes Display GST Column: No  
 Remark Display: Per Price Table Display Remark in New Item Form: Yes  
 Enable Copy Prev: No Enable Item Ended: By Item

Item Specification Display	Display left of Price Table	Display above Item Price	Display below Item Price
Not Displayed		Service Route Name (if applicable)	
Port of Loading		Port of Loading in Asia	
Port of Discharge		Port of Discharge in Europe	
Port of Discharge in Asia		Container Load Type	
Port of Discharge in North America			
Port of Discharge in South America			
Port of Discharge in Persian Gulf or Africa			
Port of Discharge in Oceania			
Vessel Name			

**Replacement Item Template**

Replacement Item Template: Replacement Liner(Europe)  
 Edit Delete Assign Format to Items

In the Survey Template page indicated in Figure 6, DOS officers can configure the settings for e-surveys. The settings include specifying the email templates to be sent to respondents and enabling the appropriate actions (e.g., request to unlock survey, request for survey extension) to be automatically triggered by PIES.

**Figure 6: PIES Survey Template Screen**

**View Survey Template**

Survey Template Id: 59  
 Index Series: 201 - Sea Freight Transport Price Index (SFTPI) Base Period: 2022 (Jan 2022 - Dec 2022)  
 Survey Name: Sea Freight Transport Price Survey Survey Code: -  
 Data Gran: Monthly  
 Remark: -

**Internet Settings for Base Period**

Publish Email: - Mailbox Message Email: Mailbox Message  
 Acknowledgement Email: -  
 Acknowledgement Message: -  
 Extension Duration: 14 Maximum Extension Duration: 25  
 Survey Help: -

**Internet Settings for Survey**

Maximum No Price Period: 3 Archive Survey After Days: -  
 Unlock Approval Email: - Extension Approval Email: -  
 Online Survey Introduction: -  
 Declaration Message: - Unlocked Message: -  
 Delete Blank New/Replacement Item Forms: No

**Survey Form**

Downloaded File Name: SFTPI\_<<Survey Period From>>-<<Survey Period To>>-<<Establishment Name>>  
 Excel Worksheet Name: <<Item Template Name>>-<<Item Code>>  
 Number of Periods: 6 Number of Editable Periods: 3  
 Add 1 Survey Period Before (New/Replacement Item Form only): Yes Print Orientation: Landscape  
 PDF Top Margin (cm): 0.3 PDF Bottom Margin (cm): 0.3  
 PDF Left Margin (cm): 0.3 PDF Right Margin (cm): 0.3

**Survey Header**

Left Column: <b>UEN <b>UEN>></b> Right Column: <b>Survey Period</b>-<b> <<Survey Period To>></b>  
 Center Column: <b>Establishment Name</b><b> <<Item Code>></b>  
 <b>SINGAPORE DEPARTMENT OF STATISTICS</b>  
 Sea Freight Transport Price Survey<b></b>

Introduction: 1) Please provide the requested information for the services specified in the survey form. If the provided information is incorrect or has been revised, please contact the officer in charge to make the necessary amendments.  
 2) If a service has ended, please provide a replacement by filling up the attached replacement form with the requested information of the new service. Please make extra copies of the replacement form if there is more than one replacement service.

**Survey Footer**

Text: -  
 Left Column: - Right Column: -  
 Center Column: <b>CONFIDENTIAL</b>

Edit



Besides e-survey settings, DOS officers can also configure the setup of the survey form with the use of placeholders, specify the name of the Excel or PDF containing the survey form and indicate the instructions to complete the survey. Figure 7 presents the Excel survey form based on the corresponding settings indicated in Figures 5 and 6.

**Figure 7: Survey Form in Excel**

<b>UEN: 123456789C</b> ABC PTE LTD	<b>SINGAPORE DEPARTMENT OF STATISTICS</b> <b>Sea Freight Transport Price Survey</b>	<b>Survey Period</b> Mar 2023 - May 2023				
1) Please provide the requested information for the services specified in the survey form. If the pre-filled information is incorrect or has been revised, please contact the officer-in-charge to make the necessary amendments. 2) If a service has ended, please provide a replacement by filling up the attached replacement form with the requested information of the new service. Please make extra copies of the replacement form if there is more than one replacement service.						
<b>Container Liner Service (Asia - Europe):</b>						
Service Route Name (If applicable) <input style="width: 100%;" type="text"/>						
Port of Loading in Asia <input style="width: 100%;" type="text"/>						
Port of Discharge in Europe <input style="width: 100%;" type="text"/>						
Container Load Type <input style="width: 100%;" type="text"/>						
<b>Rate</b>	Currency	UOM	Feb 2023	Mar 2023	Apr 2023	May 2023
Ocean Freight Rate						
Load Port Terminal Handling Charges						
Discharge Port Terminal Handling Charges						
Bunker Adjustment Factor						
Other Seaborn Surcharges						
<b>Remarks</b>						
CONFIDENTIAL						

## E-Survey

Similar to POES, PIES provides survey respondents with the option to submit their survey responses via email or online. For the former, they may fill up the softcopy survey form (Figure 7 is a sample of the Sea Freight Transport Price Survey) and email the completed copy to the designated DOS officer.

For the latter, survey respondents will be required to access PIES using their Corppass<sup>1</sup> accounts. Once the login is successful, they will be redirected to the online e-survey form as shown in Figure 8 below, where they can fill in the required price information. To reduce respondent burden, any data entry will be auto-saved so that survey respondents do not need to restart the entire submission if they close the page unintentionally. Simple validation checks are also embedded in the e-survey page to ensure all mandatory fields are filled. If the survey is submitted successfully, an automated acknowledgment email will be sent to the survey respondents for their record.

<sup>1</sup> Corppass is the authorisation system for entities to manage digital service access of employees who need to perform corporate transactions.

**Figure 8: Online E-Survey Form**

**Survey:**  
**Sea Freight Transport Price Survey**

0101010101026  
 0101010102007  
 0101010104003  
 Replacement Liner(Intra - Asia)  
 Replacement Liner(N America)  
**Replacement Liner(Europe)**

Supporting Document (Optional)  
 Save as Draft  
 Close without Saving

● This replacement form was generated as you had indicated that one service/item under survey form: 0101010104003 had ended. If you are unable to provide a replacement for the ended service/item, please delete this form using the "Delete Item Form" button at the bottom of this page.

● 1) Please provide the requested information for the services specified in the survey form. If the pre-filled information is incorrect or has been revised, please contact the officer-in-charge to make the necessary amendments.  
 2) If a service has ended, please provide a replacement by filling up the attached replacement form with the requested information of the new service. Please make extra copies of the replacement form if there is more than one replacement service.

**Container Liner Service (Asia - Europe):**

Service Route Name (if applicable)   
 Port of Loading in Asia   
 Port of Discharge in Europe   
 Container Load Type

Currency	UOM	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023
Indicate as No Price		Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Rate</b>								
Ocean Freight Rate	<input type="text"/>							
Load Port Terminal Handling Charges	<input type="text"/>							
Discharge Port Terminal Handling Charges	<input type="text"/>							
Bunker Adjustment Factor	<input type="text"/>							
Other Seaborne Surcharges	<input type="text"/>							

Remarks  
 This is to replace a service/item you indicated as ended in survey form: 0101010104003

< Previous Form    Go to Replaced Item    Delete Item Form    Proceed to Submit

**V CONCLUSION**

The COVID-19 pandemic has resulted in significant ripple effects to DOS’s survey operations and accelerated the adoption of digitalisation in our work processes. Prior to the pandemic, DOS has already been providing survey respondents with the option to submit their survey responses “paperlessly”. However, it was only during the peak of the pandemic when most workplaces were converted to remote work, that we saw a spike in the submission rate via email or e-survey. DOS officers promoted the convenience of email and online surveys since respondents were unable to access the postal surveys mailed to their office addresses during Singapore’s nationwide lockdown. In addition, DOS officers had to put in additional efforts to convince a small proportion of our survey respondents given the lower digital literacy and inability to keep pace with the changing digital landscape at the time.

To date, 97 per cent of our respondents have adopted either email or e-survey as their preferred mode of survey submission. The development of PIES has brought about significant benefits to survey and work processes in DOS while providing greater convenience to our survey respondents.