Prediction and visualization of the medium to long-term supply chain

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Abstract

Procurement Division considers various matters with an eye to possible future changes for the shift to electric vehicles. The main work of Project Procurement Department, to which the author belongs, is the coordination of supplier selection activities for new units and purchased parts cost lowering activities for current units, the compilation of information on medium to long-term unit quantities and its deployment within the department. This paper considers whether new valuable information (data) that can be used in consideration of the future of JATCO can be generated using a DX tool to combine currently-held information (data) handled in this work. This paper introduces the details of specific initiatives.

1. Introduction

It is said that the automobile industry is currently undergoing a "once-in-a-100-years" transformation, and the shift to electric vehicles is accelerating.

Since JATCO's main products will also change from automatic transmissions (ATs) and continuously variable transmissions (CVTs) to electric units, the parts used, suppliers and transaction amount will also change greatly.

In Procurement Division, looking ahead to this kind of future, moves to suppress the productivity inefficiencies expected due to a significant decrease in suppliers and the numbers of ATs and CVTs, and efforts to secure stable supply and maintain price competitiveness have started together with suppliers.

This activity is referred to as the "ICE transformation." Consequently, to contribute to this activity, it was decided to take on the challenge of finding out whether the future supply chain can be predicted by combining "currently-held information (data)" using DX, and whether we can provide visualized information to enable the early discovery of opportunities in the reconstruction of the future supply chain.

2. Aims of the initiative

The three following aims were set on this initiative.

(1)Generation of "valuable information (data)" by combining "currently-held information (data)"
(2)Visualization of data so that information can be grasped visually and easily
(3)Ensuring of security to protect confidential information such as supplier transaction amounts and unit quantity information

Taking these three aims as the pillars of the activity, this paper considers the data to be used, how to combine it and how to incorporate DX.

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3. Tools used

Based on the three aims of the activity above, the following functions and features were considered suited to the content of this activity for the DX tool, and kintone [1] was used.

(1)It is possible to read Excel [2] data and set access authority in detail using standard functions.

(2)Data combination and calculation can be carried out automatically by using an additional program with expanded functions known as a plug-in.

(3)Graphs and dashboards [3] can be prepared simply.

The plug-in functions used were the expanded functions krewData [4] for data combination, calculation and output, and krewDashboard [5] for dashboarding. With krewData, aggregated data flow across apps can be prepared by intuitive operation, and with krewDashboard, the data of each app can be made into various kinds of graphs in accordance with the purpose by simple drag and drop operation, and they can be displayed in a dashboard on one screen.

4. Prediction of trends in medium to long-term parts purchasing amounts

Predictions of medium to long-term annual parts purchasing amounts were calculated by “purchase price for each part number × future numbers of parts used in a unit.”

Specifically, the purchased parts list (part number, part name, number of parts used per unit, supplier, price, etc.) for each unit, and the medium to long-term number of parts classified by unit were used. Both types of data are “currently-held information (data)” used in the normal business of cost management and project management in Project Procurement Department.

These two types of Excel data were read into kintone, and a flow was prepared to combine the data and perform automatic calculations with krewData (Fig. 1).

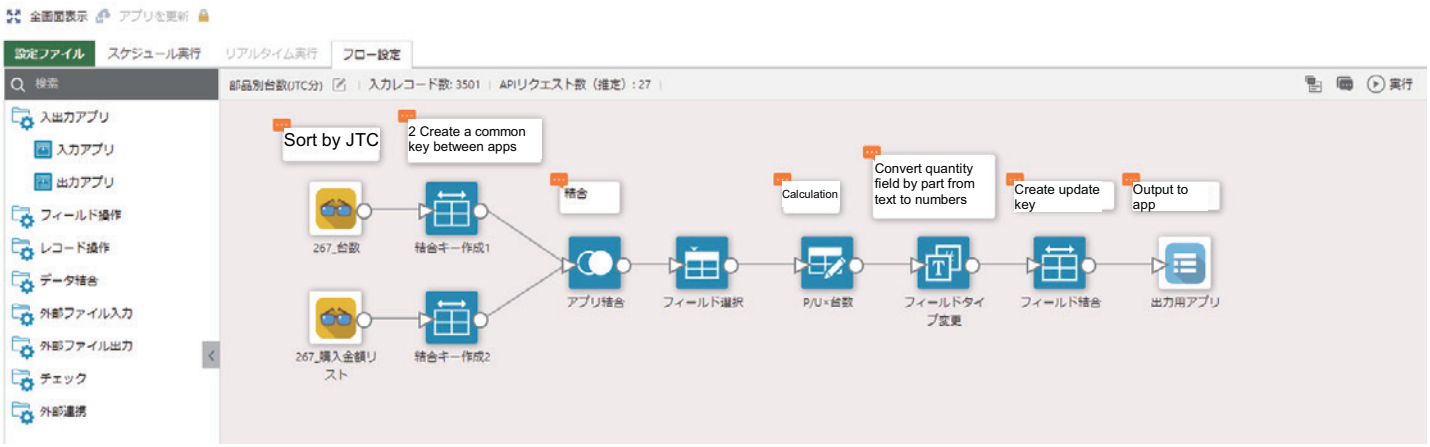

Fig. 1 krewData setting screen

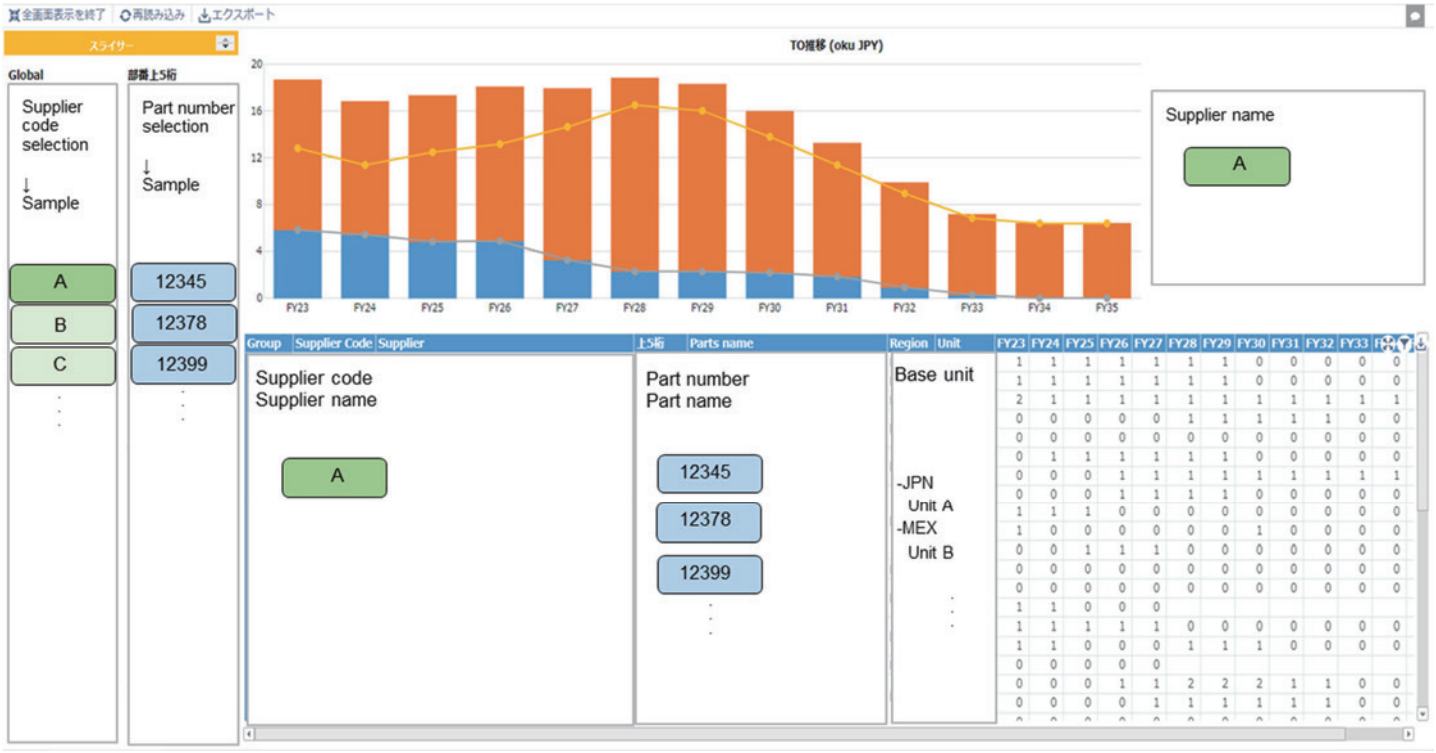

Fig. 2 App dashboard screen
(prepared using krewDashboard)

In addition, about 70,000 pieces of data calculated by this method were graphed and a dashboard prepared using krewDashboard (Fig. 2).

If a slicer is installed on the left side of the screen and a supplier or part number is selected, the graph and pivot table in the center are linked.

The trend in the purchase price can be confirmed at a glance on the graph by supplier or part number, and more specifically, detailed, broken-down information such as the purchase price by unit, production base and year can be confirmed on the pivot table.

In addition, it is also possible to output these data to PDF and Excel and use them.

The point we struggled over was that a data format easy for humans to understand and a data format easy for computers to understand are different. We often summarize data in a so-called tabular format with vertical and horizontal axes, but it is necessary to have data in a table format with one row and one set of data as a preliminary step to combine and aggregate data using a computer. The number of parts data used in this initiative was in a tabular format with the vertical axis for units and the horizontal axis for fiscal year, but when the data was combined in krewData still in that format, it did not align well with the table format purchased parts list and the flow became extremely complex. When the data was combined after using the query function to correct the table format, it was possible to prepare a simple flow like that in Fig.1. This data cleansing [6] work is a very important point in DX, and felt like a point that anybody would struggle over as a preliminary step.

5. Result

The three aims mentioned above were achieved as follows.

(1)Generation of "valuable information (data)" by combining "currently-held information (data)"

By using the data we handle in ordinary business such as cost aggregation and project management, and combining it using DX, it was possible to generate data with utility value in "ICE transformation" activities.

(2)Visualization of data so that information can be grasped visually and easily

It was possible to realize data aggregation from various starting points, such as by supplier or part number, and visualization using the dashboard function.

(3)Ensuring of security to protect confidential information such as supplier transaction amounts and unit quantity information

Using kintone functions, it was possible to ensure security by setting access rights in accordance with each individual's role such as browsing rights, app editing rights, data deletion, data output, etc., and removing the browsing rights of anybody other than related parties.

This app started operation in March 2022, and when Parts Procurement Department communicates with each supplier about "ICE transformation" activities, it actually outputs and uses data from the app.

Until now, individual buyers in Parts Procurement Department had to identify all of the parts used in each unit for each supplier, obtain the future parts quantity data for that unit, and calculate and graph the purchasing prices, and it took a considerable amount of work time. However, by using the newly created app as master data and performing maintenance regularly on the project side, it is possible to provide the latest information at all times, and people on the user side can obtain their desired data right away by intuitive operation from the dashboard screen.

6. Future outlook

We will not only retain the various types of data that we own, but will also generate significant new utility value when we combine it with other data and knowledge for a particular purpose.

More valuable methods of use should also be possible with the output produced in Project Procurement Department this time by combining it with other data and knowledge possessed by other departments.

For example, by extracting similar parts from each unit and multiplying data arranging each respective supplier, parts prices and specification compatibility by the medium to long-term purchasing amounts by supplier and part that were the output data this time, it will be possible to create material to consider the consolidation of part numbers and the integration and downsizing of suppliers' production lines.

If we can connect to things like the improvement of productivity, the stability of supply and cost reductions by doing this, we will be able to aim for the establishment of a more appropriate, more robust supply chain.

To realize this using DX, it will be necessary to unify the organization of the data to be combined so that the system can be understood easily. As mentioned above, this data cleansing work was one of the points we struggled over in this initiative, and required a great deal of manual work. From now on, we also want to work on creating a system so that people can combine data freely and quickly to create the data they want.

We want to continue working on DX while using digital technology appropriately so that we can provide future-oriented data that is valuable not only for JATCO, but also for suppliers during this great era of transformation.

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(1)(4)(5)kintone, krewData and krewDashboard are registered trademarks of Cybozu Inc.

(2)Excel is a registered trademark or trademark of Microsoft Corporation in the United States and other countries.

(3)A data visualization tool that organizes various data graphically so that it can be understood at-a-glance (Reference https://liskul.com/dashboard-28575).

(6)Improving the accuracy of data by correcting data errors, non-entry, duplication and other errors (Reference https://business.ntt-ast.co.jp/content/cloudsolution/column-357.html).

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