AN IMPROVEMENT OF INSTRUMENTS UTILIZATION: A CASE STUDY OF GLOBAL MEDICAL DEVICE COMPANY

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ABSTRACT

The objective of this project is to study the as-is process that Global Med Company (Global Med) has performed in the operation on an inbound and outbound basis. The reason for this deep analysis is the delay in serving the instrument of Global Med from July 2020 to December 2020. The delay and unutilized instrument cases have contributed to the loss of the company, both from financial and non-financial views. Especially delay in the supply or delivery of the instrument set will result in the postponement or cancellation of the operation, as well as a case and complaint from the customer. Applying a process map (swim lane) was to see the linkage between the processes and a Cause and Effect diagram (Fishbone) to identify the causes of the problem and prove whether current processes are being performed. To figure out how to improve the operational process, consider transportation routes, reverse logistics, and rescheduling to help improve the lead time from start to return to the distribution warehouse or movement between one drop and another drop. Developed and applied to real operations from January 2021 to December 2021 and maintained to the present. The results from each tool have affected the Global Med Company's service performance by improving by 3% to meet the customer's requirements for 12 months in 2021 and by a significant 2% in 2022.

Key words: *Operation, Process, Improvement, Instruments*

บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษากระบวนการตามที่ดำเนินการอยู่ ซึ่งบริษัท Global Med ได้ดำเนินการทั้งขาเข้าและขาออก เหตุผลสำหรับการวิเคราะห์เชิงลึกนี้คือความล่าช้าในการให้บริการด้านเครื่องมือของบริษัท ตั้งแต่ เดือนกรกฎาคม 2563 ถึง ธันวาคม 2563 ในส่วนของความล่าช้าและกรณีเครื่องมือที่ไม่ได้ใช้งานให้เป็นประโยชน์มีส่วนทำให้บริษัทสูญเสียทางการเงิน และทางด้านอื่น ความล่าช้าในการจัดหาหรือส่งมอบชุดเครื่องมือจะส่งผลให้มีการเลื่อนหรือยกเลิกการดำเนินการ ตลอดจนกรณี และการร้องเรียนจากลูกค้า โดยใช้แผนผังกระบวนการ (swim lane) เพื่อดูความเชื่อมโยงระหว่างกระบวนการ และแผนภาพก้างปลา (Fishbone) เพื่อระบุสาเหตุของปัญหา และพิสูจน์การดำเนินการของกระบวนการปัจจุบัน มองหาวิธีปรับปรุงกระบวนการปฏิบัติงาน โดยพิจารณาเส้นทางการขนส่ง การขนส่งแบบย้อนกลับ และการจัดกำหนดการใหม่เพื่อช่วยปรับปรุงระยะเวลารอคอยสินค้า ตั้งแต่เริ่มต้นจนถึงกลับไปยังคลังกระจายสินค้า หรือการเคลื่อนที่ระหว่างจุดหนึ่งไปยังอีกจุดหนึ่ง พัฒนาและประยุกต์ใช้กับการดำเนินงานจริงตั้งแต่ เดือนมกราคม 2564 ถึง ธันวาคม 2564 และคงใช้อยู่จนถึงปัจจุบัน ผลลัพธ์จากเครื่องมือแต่ละอย่าง ส่งผลต่อประสิทธิภาพการบริการของบริษัท Global Med โดยสามารถตอบสนองความต้องการ

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ของลูกค้าเพิ่มขึ้น 3% ในปี 2564 และเพิ่มขึ้น 2% ในปี 2565

คำสำคัญ: การดำเนินการ กระบวนการ การปรับปรุง เครื่องมือ

INTRODUCTION

Global Med is a Global Medical device company that is ranked in the top 5 in orthopedic surgery, which has an issue with the insufficient instruments to serve the surgical cases that need to be delivered to the customer before the operation date because this process impacts the operation schedule. Delays in the supply or delivery of the instrument set will result in the postponement or cancellation of the operation, as well as a case and complaint from the customer. For example, once the case has been confirmed and there is no information of supply disruption, the process of patient lab testing will proceed as per the schedule, and the patient needs to be admitted to the hospital in advance before the surgery date. But in the end, the company cannot supply the instruments to meet the expected date at least one day earlier, which will impact the whole operation for the customer side. In this case, the customer (hospital) requests the company to provide an explanation and corrective action to prevent this kind of situation. At the same time, the competitor who can immediately support the customer when the company gets stuck will earn the trust of the customer, and the company will lose market share to the competitor implicitly.

The objectives of this research were as follows:

1. To clarify the as-is process of the current end-to-end operation level.
2. To identify value-added and non-value-added components in the booking process of surgical cases.
3. To find a possible solution that can be applied to the operation and improve the performance of instrument utilization.
4. To clarify the to-be process and to sort out whether additional instrument sets may be required based on the process.

The researcher used information from July 2020 as a starting point to collect the data until December 2020. The implementation took place from January 2021 to December 2021, and the results were monitored until June 2022. The data validation for the whole project took 18 months from January 2021 until June 2022.

REVIEW OF RELATED LITERATURE

Transportation Management

Nowadays, transportation is a challenge to all managers who manage work in the supply chain area, as it is an area that remains critical to overall logistics and supply chain success, which relates to cost-effectiveness and value-added among the processes. This includes resource availability to manage the operations of both inbound and outbound goods and delivery of goods to the destination, with the advantage of combining all related activities at the lowest cost (Bowersox et al., 1999; Moultrie, 1998). Mode/carrier assignment decisions need to be taken into consideration based on the market's requirements such as lead time to deliver goods or customer's due date,

which mode can be used to meet requirements. Carriers need to be managed from this multimodal pool based on availability and existing rates (Lillibridge, 1996).

Routing and scheduling are also important as they can trigger routing problems when there is too much or too little demand (Tsai, Lu, & Chang, 2016). According to the research, once routing and queueing are implemented into the process by managing route arrangement and using a review schedule, lead time is reduced by earning more in output and productivity.

Reverse Logistics

Generally, it has been recognized that organizations are required to maintain product traceability throughout their supply chain to handle product recalls and to ensure efficient use and distribution of distributed stock.

To apply this in business, you can manage the inbound and outbound activities. With this, reverse logistics can fulfill the requirement for product movement from origin to destination and reverse back from the destination to the origin. Agrawal, Singh and Murtaza (2014) said that companies focus on selling the product to customers and do not consider the improvement of recycled products that can be returned to customers. Some can be returned randomly and uncertainly. They would like to apply the forecasting tools to improve and get to see the valuable items that are returned by data collection for the product life cycle and company network. It is foreseen that it helps to determine the expected time of the return of the product, which is not difficult, but requesting more flows to control can also utilize the reverse logistic estimation for future planning.

This can apply to the same concept of reverse logistic process control measures for the pharmaceutical industry supply chain that needs to develop and find the solution to collect the goods back from the market while limited by information and managed by a third party (Kumar, Devaney, & Dieveney, 2009) For various reasons, similar things are tried to find the best solution to collect the goods after being distributed into the market. The challenge is the communication and workflow that determine the sustainability and success of reverse logistics.

RFID

It is important to consider quality traceability in order to implement RFID in the healthcare business that has a concept similar to a barcode. But RFID is more applicable in logistics management to monitor the movement of goods or shipments by attaching them to the carton, box, or pallet with a variance of size with real-time tracking. Implementing RFID requires both software and hardware. To apply RFID in business, the key factor that challenges RIFD is how to merge the technology and integrate it into current business processes (Wamba & Chatfield, 2009).

Many business enterprises and the health industry are applying the advantages of RFID to experimental projects to improve operational efficiency and gain a competitive advantage (Bilgen & Ozkarahan, 2004). To apply RFID to businesags needs, consider the investment and equipment to add to the processes and think through the relative of technology that includes a tag, a reader/scanner, and a software program that combines RFID devices and an organization system. The study focuses on and involves the schedule of operations for outpatient surgery in the hospital to look at the processes that occur due to errors, bottlenecks, or restrictions that may happen by

people, location, place, or equipment as well as identify the various costs associated with the outpatient surgery process.

Routing Shipment

The improvement of routing operations performance has been a great concern and has become a critical part of an organization driven by volume and timing constraints. The distance reflects the cost significantly. The study describes various types of waste, such as waiting, incorrect processing, unnecessary movement, and resource utilization, which are the key elements related to routing management. Waste elimination is one of the early efforts to improve transportation efficiency (McKinnon et al., 1999). Eliminating unnecessary travel can improve transportation efficiency.

The scheduling and routing problem is a type of vehicle routing problem. Yan and Chen (2011) indicated that past carpooling studies have focused on the to-work problem (from different origins to a common destination) or the return-from-work problem (from the same origin to different destinations). Scheduling a route connecting the event and the location is mostly managed by human experience, and it lacks the standardization to manage the queue, resulting in ineffective movement due to human error.

Cause and Effect Diagram

A Cause-and-Effect diagram is a visual tool used to logically organize the many possible causes of a specific problem or effect by displaying them graphically. The Fishbone form has a similarity to a fish, which has a head (as an effect) and a body in the form of bones, illustrated as causes of known problems (Slameto, 2016).

The study describes an overview and steps of vision and mission, self-review, identification of needs and problems as a preparation stage, analyzing problem roots causing a gap by using Fishbone analysis, developing an innovative action plan and implementation design, and monitoring and evaluation. Fishbone is the planning steps to let the organization know the linkage or the limitation on the operations and separate the root cause individually, not mix up the problem among segmentation and improve on planning activities, as when planning is done well, the other management functions can be done well (Daft, 1988). The Fishbone diagram is simple and applicable and makes an effort to guide the organization to the future and how to get there.

Value and Non-Value Added

The increasing popularity of Lean thinking has analyzed value-adding (VA) and non-value-adding (NVA) as popular activities to eliminate waste and improve productivity. If so, the activity is considered value-adding (VA), and if not, the activity is categorized as waste that has either a necessary or unnecessary nature (NVA) (McManus, 2005). The study reviewed VA and NVA activities in manufacturing.

According to McCarthy and Menicou (2002), classification can improve communication efficiency, assist managers to focus attention on important activities, and identify waste efficiently in the operation process.

The research focused on efficiency improvement in the production process by quantifying the ratio between valuable output and consumed valuable input resources. Wastes were clarified into seven

categories: over-production, defects, inventory, over-processing, transportation, waiting, and unnecessary motion. Lean was a systematic identification and elimination of waste, which contributed to poor operational efficiency. To describe VA and NVA, the different definitions are defined by customer expectation and satisfaction by clarifying the VA and NVA at the activity level.

Workflow

When people experience flow, they consume energetic and cognitive resources (Barros et al., 2018). The research focused on strength use, which links and creates the work-related flow. It (work-related flow) describes how employees transfer their knowledge to the daily operation, which depends on factors such as age, education, and gender, leading to risk-taking and attention-seeking behavior. Strength use is theoretically an important antecedent of flow. During work episodes, when people use their strengths, they approach their work in a way that brings out the best. The study has revealed several factors influencing risk-taking, such as the perception of risks and positive affect.

The researcher realized that the workflow is determined by the perception of understanding, contained the knowledge and ideas, and connected each point along the way. To develop workflow into a business requirement, you need to adjust between possibility and expectation. In the current study, the researcher designed the workflow to help in decision-making by using the experience of the person who can prove it is necessary and ensure it is necessary to the business.

RESEARCH METHODOLOGY

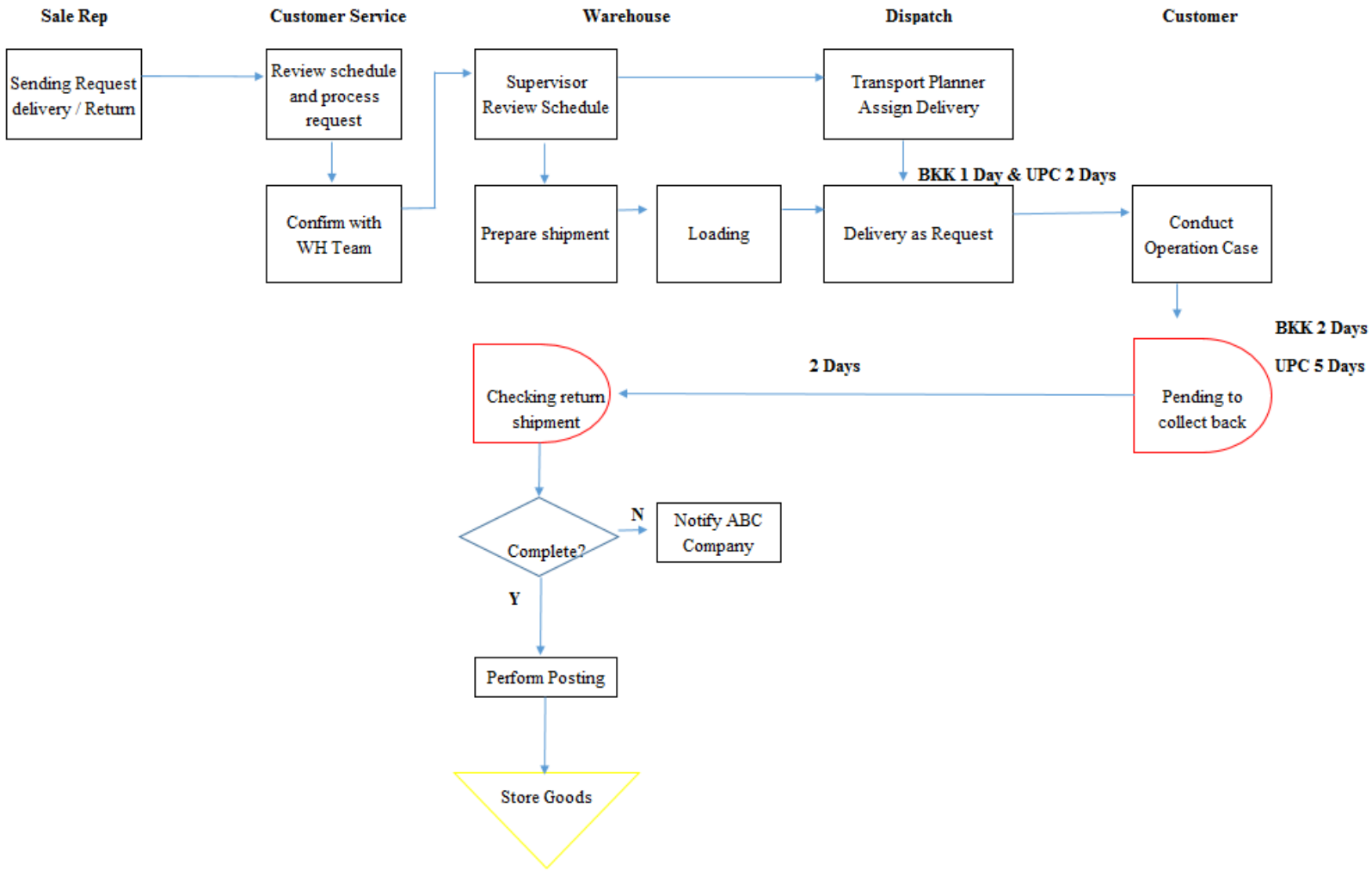
This section includes the research methodology and possible tools to identify the root causes. In addition, it proposes a suitable model to apply and improve the business processes by reducing the cancellation of operation cases and better utilizing on-hand resources.

According to Global Med, the average operation case per month from July 2020 to December 2020 was 172 cases, an impact delay of 27%. Considering in terms of the high volume from October onwards, the average case per month was 228 cases, which led to more delays. The increasing number of cases requires more accuracy and capability in service and delivery

Process Map (swim lane)

Define the value-added and non-value-added and deep drive-in details, whereas areas for improvement in the operation processes started from order booking until the shipment was reversed back to the distributor's warehouse. The processes when there is case booking and transaction activity in the chain. The outcome demonstrates that time is wasted on collection after the operation case is completed, and the return from the customer to the warehouse also takes a long time for the checking process. The entire process takes three days in the BKK area and six days in the UPC area. The standard time to complete the process in a distribution warehouse should not be over 24 hours. For the dispatch process, the earliest that should be done in BKK is four hours, and upcountry is one day. The arrival date and time are determined by the case booking and the surgery schedule. Most of the delays happen in ship-out and return processes, which impact future cases that may require the use of the same instrument set in a different area. This starts from

Figure 1: The Operation Process of Case Setting for Inbound and Outbound



the case booking receipt to the order confirmation, then to outbound delivery until the shipment is dispatched to customers.

Cause and Effect Diagram

Fishbone diagram identifies possible causes for delays in the return process. From the operation point of view, what the researcher can receive from the brainstorming process, the key factors are the long lead time for the operation process that needs to be improved. The operation needs to consider the main factors that can improve time reduction for the return process. The operation staff, who is the first point of contact, receives the request and must be enough to support and cover daily requirements. The methodology of planning and equipment for inbound and outbound operations does not have a system for traceability of process and timeline. The operation also needs to have an efficiency report to summarize the output and areas of improvement. Then, redesign action and pilot testing for future clarification on process improvement. With this, we can see the outcome once the business has changed, such as routing for BKK and upcountry and identifying a specific lead time for outbound and inbound activities.

Recognize Waste for Non-Value-Added Activities

At the process and operation level, the researcher reviewed the whole chain and found that there is waste in the process that needs to be considered, especially time reduction. To describes the non-value-added activities related to waste. These impact the emotions of the people who manage the operation, who may receive feedback or complaints from customers about the delay or unperformed process. Also, the waste that occurs during the operation process needs to be considered, and solutions must be found to reduce lead time or avoid unnecessary activities.

PRESENTATION AND CRITICAL DISCUSSION OF RESULTS

Based on the data, this section presents how the operations team of Global Med uses these developed criteria to manage and improve processes. Then, the steps of developing criteria for verification are implemented. Finally, the researcher presents each method of the to-be process that is applicable in a real-world setting.

Implement SLA (Service Level Agreements) and Route Consolidation

To perform operations, following SLA, the researcher needed to have a final agreement from the management team of the Global Med and alignment from the operation team – MDD by the set KPI of the commercial team to rely on the process and step.

The research anticipated reducing operation lead time and hospital transition, focusing on the North and Northeast territories and requesting support from the operation team to treat SLA in the same manner as the BKK zone. Referring to the record from January 2021 to December 2021, a total of 2,056 transactions consolidated the shipments in the North and Northeast areas.

Approval Matrix of Urgency

Approval Matrix to let concerned parties know about the process and the authorized person who can approve extra costs that may occur from the incident of urgency.

Table 1: SLA's Delivery and Return

Area	Order Cut off	Delivery by
BKK-Normal	12:00 (Noon)	Same day
	After 12:00	Next day before noon
	After 16:00	Next day afternoon
BKK – Urgent (with additional charge)	Within working hour	Within 4 hour
	Outside working hour	Within 6 hour
Central - Normal	16:00	Next day
Central – Urgent (with additional charge)	Within working hour	within 4-8 hour
	Outside working hour	Next day 12:00
Other area – Normal	10:00 AM	Next 2 days
Other area – Urgent		Subject to public transport

Implementation and performance tracking by using the concept of Utilization (Turn Rate)

$$\text{Turn Rate} = \frac{\text{Total request of case}}{\text{Number of instruments}}$$

The maximum movement in 12 months is 10 times, while the maximum must not exceed 7 times. The average is 5, which is on track and can prove the business still has visibility to manage the efficiency of transactions. This data is shared at a regional level, which is the subsequence of asset management review.

RFID Preparation

During the implementation of previous tools and concepts, the researcher got information that MDD has a plan to launch RFID in the operation in 2021 and can apply it to instrument management to improve inbound and outbound processes. The tentative implementation timeline is in the first quarter of 2023 because MDD needs to check all available sets in the warehouse and the sets pending in the market, as well as consider various concerns about RFID from all stakeholders.

SUMMARY FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

After applying the SLA, Route Consolidation, and Approval Matrix of Global Med in 2021, the researcher found that performance comprises time and utilization, which can improve and optimize the delay in the operation process, which directly affects company and customer expectations.

Referring to the total of surgery cases from January 2021 to December 2021, if we separate and review the performance, overall, 24% did not meet the expectation. Since the performance continued to track until June 2022, in the six months starting from January to June 2022, the performance of 22% led to criteria of "not meet expectation," which was a 2% improvement compared to 2021 but increased by 5% when compared to 2020 before implementation. This proved that all implications and tools were still valid and useful.

In the case of a separate review of the performance by segmentation before implementing those tools from July 2020 to December 2020, the logistics performance of Global Med fell by 27%. The Global Med does not consider the company to be leading the market. As a result, it never stops developing the process by getting support from a new distributor that has less experience in the medical device business but keeps learning and improving the performance with an open mind and is full of service mind, striving to achieve one goal.

The root causes were that staff were new to the business and the complexity of the transaction with dynamic expectations. When performing the distributor transition, there was no specific task and no mandatory steps. Also, there was no trial run on business exercises to simulate the volume together with requirements. The tools such as systems and trackers have taken place later after the transition period and apply to the real business that continues to run without a stopping point. The underestimation of business expectations and growth was also an important root cause, which needs to be developed and trained before on duty.

Figure 2: Result Before vs After Improvement

Before Implementaion

Number Of Operation Case By Month By Area During July 2020 - December 2020				
Area All	6 Months	Meet Expectation	Not Meet Expectation	Grand Total
Grand Total		**1,507**	**547**	**2,054**
		73%	**27%**	

After Implementation in 2021

Number Of Operation Case By Month By Area During January 2021 - December 2021				
Area All	12 Months	Meet Expectation	Not Meet Expectation	Grand Total
Grand Total		**7,320**	**2,330**	**9,650**
		76%	**24%**	

After Implementation in 2022

Number Of Operation Case By Month By Area During January 2022 - June 2022			
Grand Total	**5,055**	**1,464**	**6,519**
	78%	**22%**	

This was proven after applying the control tools of SLA, Route Consolidation, and Approval Matrix as the indicators to prove the improvement by 3% of the cases that do not meet expectations on delivery, which means that Global Med can continue to improve and has the visibility to manage the overall business by the response to the customer's voice.

In the first half of 2022, the results showed a total of 6,519 cases, of which 78% fell into meet expectations and 22% did not meet expectations. So, 2% was improved in 2022.

Correct and efficient operations are important to the company since they can be valuable resources. At the same time, it is important to run a business with awareness and try to respond successfully to a customer's requirements. Regarding the summary of the findings combined with the data of GLOBAL MED Company, the company has focused on improvement and sustainability in the process of work. This does not relate only to the operation, but it also needs to have support and alignment from the commercial team to implement all indicators.

Logistics demand is rapidly changing, and cost may be an issue in the near future. Then the better way is to think of what the existing data and tools can do to imply internal change with less cost. They do not require any extra implementation costs that impact the business by utilizing on-hand data and tools. On the other hand, continuing to monitor performance based on existing data and adjusting as needed will aid in long-term sustainability. The possibility is to be different from each scenario, reflecting the company's vision, mission, strategy, and requirements.

The researcher recommends a monthly review of the performance and information updates to ensure that the company can meet the market demand and that the criteria still contribute benefits to the company. To review the existing facilities and on-hand instrument set compared with the expected increase in surgery and business growth, the company needs to consider during annual budgeting whether to invest more if foreseen the risk of an insufficient instrument set is about six months away and not be able to immediately allocate the set without an advance forecast to the global set planning team.

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