

# Point of Sale's Transaction Data: Envisioning Micro Small and Medium Enterprise (MSME)'s Inventory Management Strategy

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**Abstract:** *With the progression of Big Data Analytics (BDA), Point of Sale (PoS) could be amalgamated with Inventory Management (IM) system, thereby assisting merchants in providing an overview of their inventory and even predicting when restocking is necessary. This qualitative inquiry aims to assess the merchants' awareness of digitalisation in Klang Valley, Selangor, Malaysia, from October to November of 2023, with total number of thirty merchants being interviewed. NVivo 12 was used to support analysis tasks. The results are inconclusive, as some merchants still rely on separate systems for their PoS and IM. Those who lack IM system but possess digital PoS still believe that they can sustain their inventory management through manual means. Even when IM is integrated with PoS, workers still prefer to inform the manager verbally when the stock is nearing depletion. Only those who diligently utilise the integrated system can truly appreciate the benefits of their investment in the digitisation of their daily operations. These study could provide valuable insights for governing authority, such as the Ministry of Domestic Trade and Cost of Living (KPDN) and the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU), in incorporating essential content into their educational programs to promote the advantages of digitalisation to Micro Small and Medium Enterprises (MSMEs), as well as to educate Solution Providers on the need to revise their software's Standard Operating Procedures (SOP) and Manuals to be available in both English and Bahasa.*

**Keywords:** Point of Sale (PoS); Big Data Analytics (BDA) on Inventory Management (IM); Big Data Analytics (BDA) on Supply Chain Management (SCM); Micro Small and Medium Enterprise (MSME)

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## 1. Introduction

A Point of Sale (PoS) might be regarded as a tangible apparatus within a physical establishment or a checkout juncture within an internet-based establishment. The software for PoS apparatuses is progressively becoming more intricate, offering characteristics that enable vendors to oversee stock and purchasing inclinations, trail pricing precision, and gather promotional data (Hayes,2023). Contemporary PoS has the potential to constitute an amalgamation of any or all of the following aspects: generating trade analyses, data examination and data depiction, data administration, stock administration, labor force

administration, Customer Relationship Management (CRM), executing a fidelity program, food distribution functionality, contactless ordering and payment (StoreHub,2023).

Inventory management's planning is an intricate and ever-changing procedure that encompasses the delicate equilibrium between supply and demand, the adept management of stock levels in Inventory Management (IM), and the optimisation of order fulfilment in Supply Chain Management (SCM). One of the primary obstacles faced by inventory planners is the precise prediction of demand and the determination of the most suitable stock levels for their merchandise. Nevertheless, thanks to the accessibility (or emergence) of Big Data Analytics (BDA), inventory planners possess a formidable instrument at their disposal, empowering them to make well-informed decisions regarding stock and demand (Conjura,2023).

The significance of Big Data Analytics (BDA) within the supply chains has experienced a notable increase in importance in recent times. This increase can be attributed to the advent of cloud computing, which has enabled supply chain partners to efficiently amass, transmit, store, and analyse vast quantities of data. Moreover, this technology has facilitated the real-time sharing of data and information among these supply chain partners. Additionally, the application of BDA in supply chains presents immense potential for enhancing various aspects of the Supply Chain Management (SCM) process. These potential benefits include the improvement of operational processes, the reduction of costs, and the enhancement of decision-making capabilities for SCM (Lee & Mangalaraj,2022).

As the boundaries between nations within the ASEAN region become increasingly permeable, there emerges a novel necessity for Point of Sale (PoS) system to accommodate regional QR code payment methods. Consequently, the transactional data pertaining to Point of Sale activities becomes more robust and standardised when ASEAN member states decide to pursue interoperability of QR codes across the following countries: Cambodia (KHQR), Indonesia (QRIS), Lao PDR (Lao QR), Malaysia (DuitNow), the Philippines (QR Ph), Singapore (PayNow), Thailand (PromptPay), and Vietnam (VietQR). The consolidation of bilateral systems into an integrated multilateral framework is mandated and instigated by the Bank for International Settlements (BIS), as it represents a crucial initial step towards materialising the ASEAN-wide QR vision, as part of the Nexus Project (Fong,2023).

## **2. Aims of the Study**

The acquisition carried out by a consumer with the intention of procuring a particular product led to a substantial influx of data, which encompasses a wide range of information such as transactional data, including details about the product itself, the amount spent, and the quantity purchased, as well as consumer-related data and environmental data, such as geographic location. This voluminous amount of data serves to provide the merchant with invaluable insights derived from the realm of big data, thereby enabling them to effectively optimise their inventory management processes, thereby avoiding the detrimental consequences of overstocking, and simultaneously allowing them to accurately predict consumer behavior and buying patterns. These predictive capabilities, afforded by the utilisation of this expansive dataset, are instrumental in facilitating enhanced decision-making processes within the MSME business industry (Sukha, 2023).

Therefore, the aim of this study is to evaluate the level to which merchants are aware of the innovation and advantages connected with integrating Inventory Management (IM) into their Point of Sale (PoS) system. This innovation has the potential to streamline the daily operations

of merchants and to potentially capitalise on sales opportunities while also reducing costs during fluctuating customer trends. The study would then observe the merchant's awareness through the enhancement of inventory decision-making processes using Big Data Analytics (BDA) from Point of Sale (PoS)' transaction data in the context of Inventory Management (IM).

This data concerning transactions has the potential to be a two-edged instrument. Internally, it provides merchants with an immediate overview of their existing inventory, thus impacting their decision-making processes regarding product and service prediction (Ananda et al., 2023a). On the other hand, externally, it grants merchants a sense of customer trends, and when combined with an effective marketing strategy, it cultivates a perception of familiarity and gratitude among their customers, and making them to feel known and appreciated (Ananda et al., 2023b).

### 3. Review of the Literature

Large-scale information without analytics is simply a substantial quantity of data, whereas the analytics without large-scale information are merely mathematical / statistical instruments and applications. As such, the utilisation of large-scale information of Big Data Analytics (BDA) in the realm of Inventory Management (IM) within Point of Sale (PoS) could be employed for the purposes of demand planning and forecasting, with the objective of effectively managing logistics operations based on historical data. In doing so, MSME would be empowered to make well-informed decisions pertaining to stock and demand (Maheshwari et al., 2021). The ability of the BDA to sort data and look for patterns and other insights, could help merchant in creating strategies for time efficiency and cost reduction efforts.

Conjura (2023) posits that with the advent or accessibility of Big Data Analytics (BDA) in the realm of Inventory Management (IM) within Point of Sale (PoS), inventory management planners are endowed with a powerful tool, enabling them to arrive at judicious determinations concerning inventory and demand.

In the context of a multi-echelon supply chain, the flow of information at the Point of Sale (PoS) assumes significant importance. This flow of information not only serves as a representation of customer demand but also has the power to automatically deplete the retailer's inventory within the framework of the merchant's Inventory Management (IM) system (Van Belle et al., 2021).

Furthermore, the Point of Sale (PoS) data holds the potential to assist the supplier in adapting to dynamic market conditions and enhancing the merchant's inventory replenishment process in a progressive manner (Kadiyala et al., 2020).

Consequently, when a Micro Small and Medium Enterprise (MSME) merchant incorporates a software application such as a web-based accounting Point of Sale (PoS) and Inventory Management (IM), the operation of their daily activities become highly feasible and effective. This type of software application effectively facilitates the merchant in the realm of managing, overseeing, and reporting their business finances, as well as providing a snapshot of their current inventory (Rahmatullah et al., 2020).

#### 4. Sample

In order to ensure a comprehensive understanding of the issue at hand, the researchers employed the purposive sampling technique, which was recommended by Patton (2015). This technique allowed for the selection of only those subjects that aligned with the objectives of the study, as per the researcher's conviction, in line with the suggestions put forth by Obilor (2023). The purposive sampling technique involves the researcher exercising their discretion to choose participants from the study population, placing the responsibility for the entire sampling process on the researcher's judgment and knowledge of the context. Between October and November in 2023, a total of thirty micro business owners who met the Malaysia's MSME criteria in Klang Valley, Selangor, Malaysia, were chosen.

#### 5. Data Collection Methods

The selection criteria used to determine the participants for this study were established based on the Micro Small and Medium Enterprise (MSME) framework, which was specifically defined by SMECorp and officially endorsed during the 14th National SME Development Council (NSDC) Meeting that took place in July 2013 (SMECorp, 2013). In the case of services and other sectors, the criteria applied to micro-enterprises were either a sales turnover of less than three hundred thousand Ringgit or an employment size of less than five employees.

The researcher was responsible for appointing an enumerator to compile a comprehensive list of potential participants for the study. The enumerator diligently followed the guidelines set forth by SMECorp to select suitable participants. In addition to the selection process, the enumerator conducted interviews with the chosen participants, ensuring that they had given prior consent to be included in the study.

To ensure a thorough understanding of the participants' perspectives, each of the thirty individuals was engaged in a one-on-one interview. The enumerator diligently visited the premises of each micro and small business to meet with the respective owners. Prior to the interview, the researcher provided the enumerator with an open-ended unstructured question:

*“Is your Inventory Management system (if any) integrated with your Point of Sale system? and why?”*

The participants were asked to provide their insights on this matter, and their short responses were recorded and stored in a Google Form by the enumerator. Additionally, out of the entire participant pool, seven individuals were selected for further engagement in a voice recording interview session, where they were able to elaborate on their answers and provide more in-depth perspectives.

Once the interviews were completed, the recorded audio files were meticulously transferred from the enumerator to the researcher. The researcher, in turn, carefully selected six out of the seven audio files based on the quality of the voice recordings. These selected recordings were then transcribed and written into a text editor, ensuring that the content was accurately captured. However, as the participants' comments were spoken in Bahasa, the researcher took the necessary steps to translate the passages into English. These translated passages were then saved in a separate text editor, guaranteeing a comprehensive and accessible record of the participants' input.

In order to consolidate the data and facilitate further analysis, the English text files containing the translated passages were combined with the short answers downloaded from the Google Form. This combined transcribed English text file, encompassing the participants' feedback and comments, was subsequently fed into NVivo 12, a robust software platform that enables in-depth qualitative analysis. By utilising NVivo 12, the researcher was able to delve deeper into the data, uncovering valuable insights and patterns that would contribute to the overall understanding of the research topic.

## 6. Data Analysis Methods

Thematic analysis, a qualitative research technique employed by researchers to systematically organise and analyse large and complex data sets, was utilised to examine the data (Dawadi, 2020). In the pursuit of identifying themes that adequately capture the narratives within the data, researchers sought to create findings that are sensitive, insightful, rich, and trustworthy (Nowell et al., 2017; Braun & Clarke, 2006). The process of thematic analysis in this study involves the meticulous identification of themes through attentive reading and revisiting of the transcribed data (King, 2004; Rice & Ezzy, 1999). To carry out the thematic analysis, a series of steps were followed. Phase 1 involved familiarisation with the data, followed by phase 2 which entailed the creation of initial codes and the establishment of categories. In phase 3, the researchers diligently searched for themes within the data, while phase 4 involved reviewing and refining these themes. Subsequently, in phase 5, the themes were defined and named, along with their associated aspects and sub-themes. Lastly, the final phase of the analysis consisted of producing the report, which required the verbatim transcription of all interviews and multiple readings of the transcriptions. During the analysis, the researchers identified units of meaning, extracted from the statements, and generated codes based on an inductive approach. These codes were then categorised based on their differences and similarities. The process of data analysis continued until data saturation was reached, indicating that no new themes or ideas emerged from the data (Caulfield, 2022).

## 7. Findings

The process involved in this study encompassed the collection of data that was derived from the participants involved in the research. Once the data was collected, it was subsequently transcribed into a text file format, in order to facilitate the ease of analysis and interpretation. Following the transcription, the data was then imported into NVivo version 12, which is a robust software program designed for qualitative data analysis. This importation into NVivo was performed with the aim of conducting a thorough and comprehensive analysis of the collected data, in order to gain meaningful insights and understanding from the dataset.

**Table 1: List of Aspects and Themes**

| Aspects  | Themes                   | Sub-Themes  |
|----------|--------------------------|---|
| PoS + IM | PoS + IM Integrated      | Able to see and monitor inventory<br>Able to forecast resupply                              |
|          | PoS & IM Separated       | Manual inventory but update IM manually<br>Prefer manual inventory by informing the manager |
|          | IM Not Utilised          | Not many SKU and IM not updated   |
| No IM    | Aware of IM Function     | Not many items and manual inventory is easier   |
|          | Not Aware of IM Function | Always prefer manual  |

To provide a comprehensive elucidation pertaining to the comprehension of inventory management qualitative analysis, a visually representative and illustrative depiction in the form of a word cloud was generated employing the utilisation of NVivo, thereby facilitating a visual manifestation of the underlying concepts and intricacies associated with the aforementioned subject matter.



**Figure 1: Word Cloud by NVivo 12**

## 7.1 Aspects

From the analysis of interview data using qualitative thematic methods, it is evident that there exist two distinct aspects that can be discerned from the study on inventory management. The two distinct aspects can be delineated as follows: Firstly, there exists a category of participants that possess both a Point of Sale (PoS) system and an Inventory Management (IM) system, which can be referred to as "PoS + IM". Secondly, there is another group of participants who do not possess an Inventory Management (IM) system, regardless of whether or not they own a Point of Sale (PoS) system, which can be classified as "no IM".

## 7.2 Themes

Furthermore, upon closer examination of the gathered information, it becomes apparent that these aspects can be further categorised into five overarching themes. The five themes were organised based on their respective aspects. The aspect known as "PoS + IM" encompassed three distinct themes. The first theme, referred to as "PoS + IM Integrated," included participants whose Point of Sale (PoS) and Inventory Management (IM) systems were seamlessly integrated in a vertical manner. The second theme, termed "PoS & IM Separated," comprised of participants who possessed PoS and IM systems that were independent and not connected to each other. Lastly, the third theme, known as "IM Not Utilise," consisted of participants who had both PoS and IM systems, but the IM component remained untouched. On the other hand, the aspect labeled "No IM" consisted of two themes. The first theme, named "Aware of IM Function," encompassed participants who did not have an IM system but possessed a comprehensive understanding of the advantages and functionality of IM. The second theme, referred to as "Not Aware of IM Function," included participants who lacked an IM system and were completely unaware of the potential benefits associated with IM.

## 7.3 Sub-Themes

Additionally, delving deeper into these themes, it is possible to identify seven sub-themes that provide a more granular understanding of the complexities and intricacies related to inventory management. The seven Sub-Themes encompass a wide range of perspectives and approaches towards Inventory Management (IM). Firstly, there is the Sub-Theme of "Able to see and monitor inventory", which pertains to participants who assert their capability to accurately

capture the current status of their inventory and effectively monitor its movement. These individuals are confident in their ability to stay informed about the whereabouts and quantities of their inventory items.

Moving on, the Sub-Theme of "Able to forecast resupply" focuses on participants who claim that their Inventory Management (IM) system enhances their decision-making process when it comes to restocking their inventory from their supply chain partners. These individuals believe that their IM system provides them with valuable insights and data that enable them to make more informed and strategic choices regarding resupplying their inventory.

Next, the Sub-Theme of "Manual inventory but update IM manually" encompasses participants who have a distinct characteristic in their inventory management practices. Particularly, in industries such as the Food & Beverage (F&B) sector, where sales do not directly correlate with inventory, these participants manually maintain the state of their Inventory Management (IM) system. Despite this manual approach, they are still able to effectively update their IM system to reflect the current inventory status.

Moreover, the Sub-Theme of "Prefer manual inventory by informing the manager", which pertains to participants who have staff members that are hesitant to fully embrace and utilise an Inventory Management (IM) system. Instead, these individuals prefer to rely on manual inventory management practices and inform their managers about the inventory status directly. This preference may stem from various reasons, such as a lack of familiarity with IM system or a resistance to change.

Another Sub-Theme, "Not many SKU and IM not updated", involves participants who possess an Inventory Management (IM) system but choose to primarily rely on manual inventory recording methods using alternative means such as book ledgers and excel spreadsheets. Despite having an IM system at their disposal, these individuals opt for manual recording due to various factors, which may include a limited number of stock-keeping units (SKUs) or a personal preference for traditional record-keeping methods.

Furthermore, encounter the Sub-Theme of "Not many items and manual inventory is easier". In this case, participants do not have an Inventory Management (IM) system in place, but they perceive the cost and effort associated with implementing and maintaining such a system to be higher than utilising other manual means, such as book ledgers and excel spreadsheets. These individuals find a greater level of convenience and simplicity in managing their inventory manually.

Lastly, the Sub-Theme of "Always prefer manual", which refers to participants who are simply indifferent or unaware of the potential advantages offered by an Inventory Management (IM) system. These individuals have no interest in exploring the benefits of an automated inventory management solution and are content with their current manual practices.

#### **7.4 Word Cloud**

The utilisation of a word cloud is a prominent characteristic of the NVivo software, as it facilitates the creation of visually appealing representations that effectively depict the frequency of various words within the data that has been imported. Specifically, the aforementioned word cloud provides insightful information regarding the prevalence of the terms "manually" and "inventory," which are found to possess weights of 6.28% and 4.93%, respectively. Upon careful analysis of this data, the researcher may draw the conclusion that a

significant portion of the participants involved in the study exhibit a tendency to engage in manual practices, irrespective of whether or not they possess Inventory Management (IM) system.

## 8. Discussion

The discussion was derived from the seven sub-themes and the word cloud. The seven sub-themes offer a thorough overview of the various perspectives and approaches towards inventory management. They encompass participants with varying levels of skill and belief in the effectiveness of Inventory Management (IM) system, as well as those who opt for manual inventory management methods for a range of reasons. Understanding these sub-themes can assist organisations in gaining valuable insights into the diverse landscape of inventory management practices and tailoring their strategies accordingly. In the word cloud, it is important to acknowledge the implications of this finding, as it suggests that the utilisation of such system does not necessarily eliminate the tendency for manual processes to persist. For the purposes of this study, the researcher will categorise the discussion into the following two categories: not utilising Inventory Management (IM) and utilising Inventory Management (IM).

### 8.1 Not Utilising Inventory Management

The United States, being the largest economy in the world in terms of nominal GDP according to the research conducted by Silver (2023), faces a significant challenge in terms of inventory management among its merchants. Specifically, a notable 43% of these merchants have highlighted inventory management as their most prominent daily hurdle, as stated by Dublino (2023). This predicament arises due to the fact that small businesses in the country do not effectively monitor their inventory or utilise a manual process. Consequently, it is not surprising that in Malaysia, a considerable number of micro businesses continue to rely on manual inventory processes.

Micro businesses are highly susceptible to the impact of fixed costs on their operations. Consequently, the aspect of inventory management is often overlooked by these entities when conducting business. This is evident from their statement: "... *not too much stuff ... It's easier manually,*" in which they express that they do not prioritise having a significant amount of inventory and find manual management to be a simpler approach.

The occurrence of the grey area arises when the presence of the Inventory Management (IM) system is established and operational, yet the merchants are unable to effectively employ it for their business purposes. Certain individuals have asserted that their employees exhibit resistance towards utilising the Inventory Management (IM) system, thereby hindering its successful implementation, by saying: "... *the staff will inform the manager directly*"

Moreover, there have been claims that the nature of their specific business operations poses a certain level of complexity when attempting to concurrently incorporate both the Point of Sale (PoS) and Inventory Management (IM) systems. This complexity stems from the absence of a direct and straightforward relationship between the number cups of drinks sold and the corresponding quantity of milk cartons utilised, evident from Food and Beverages (F&B) business.



## 8.2 Utilising Inventory Management

The thriving nature of the retail sector is heavily dependent on the presence of a well-functioning and highly efficient Inventory Management (IM) system. Irrespective of whether it pertains to a traditional brick-and-mortar establishment or a cutting-edge e-commerce platform, the successful management of inventory holds the power to determine the ultimate fate of a business, particularly in terms of profitability. It is imperative for retailers to recognise and appreciate the significance of effective inventory management within the retail industry, as it serves as a catalyst for the maximisation of profits, the augmentation of customer satisfaction levels, and the optimisation of overall operational procedures. By diligently incorporating and executing these industry-best practices, retailers position themselves favorably within an intensely competitive marketplace, thereby paving the way for sustained growth and prosperity (US Accountants, 2023).

The early adopters in Malaysia faced numerous challenges and obstacles during the initial stages of implementing Inventory Management (IM) and integrating it seamlessly with their Point of Sale (PoS) system. However, the fruits of their labor were ultimately realised as they were able to reap the rewards of their efforts. As one participant eloquently stated: "... *easy for me to check for current stock and how much to restock*," the system made it significantly easier for them to promptly and accurately assess the current inventory levels and determine the appropriate quantities for restocking purposes. Another participant recited: "... *easy to manage inventory*."

## 9. Conclusion

According to Malaysia's National Fourth Industrial Revolution (4IR) policy, cloud computing refers to the provision of computing services through the internet, with the aim of providing capabilities that promote swifter innovation, adaptable resources, and economies of scale. Big Data Analytics (BDA) entails employing sophisticated analytical techniques on extensive and diverse datasets obtained from various sources. The integration of cloud computing and Big Data Analytics (BDA) is of utmost importance as it establishes the groundwork for unlocking further prospects in novel computing technologies. These technologies encompass quantum computing, DNA data storage, as well as the amalgamation of third industrial revolution technologies with existing ones, including the Internet of Things (IoT) and advanced sensor platforms (Unit, 2021).

Malaysia has implemented several initiatives over the years to facilitate the nation's transition to Cloud and Big Data Analytics (BDA) services. One recent notable example is the DaWaK (DATA Warehousing and Knowledge discovery) conference, which took place in August 2023, serving as a distinguished platform for scholars, professionals, and developers operating within the realm of Big Data Analytics (BDA), in a comprehensive sense. The primary aim of this conference is to investigate, disseminate, and exchange knowledge in this field through the medium of scientific and industry-oriented discussions. The conference encompasses a wide range of topics within DaWaK research and practice, such as data lakes, database design (including data warehouse design and Entity Relationship – ER modeling), big data management (including tables, text, and files), query languages (including Structured Query Language - SQL and advanced alternatives), parallel systems technology (including Spark, MapReduce, and Hadoop Distributed File System - HDFS), theoretical foundations, applications, text and data mining techniques, as well as deep learning. This event will gather prominent researchers from the global communities of database systems, cloud computing, programming languages, and data science (DaWaK, 2023).

This research study has demonstrated the appropriate impetus for Micro Small and Medium Enterprises (MSMEs) to adopt digitalisation through the implementation of Point of Sale (PoS) and Inventory Management (IM). In the current competitive landscape following the Covid-19 pandemic, merchants must possess an advantage in retaining their customer base by offering unique value propositions while simultaneously managing costs effectively.

### Recommendation

Merchant, in the context of micro businesses in Malaysia, can be regarded as the foundational users of Big Data Analytics (BDA). It is desirable for the governing authority to allocate more attention and heed the concerns voiced by these Micro Small and Medium Enterprises (MSMEs) in Malaysia, given that they contribute 38.4% to the national Gross Domestic Product (GDP) (Bernama, 2023).

The governing authority, such as the Ministry of Domestic Trade and Cost of Living (KPDN), may find it necessary to engage in the process of grooming in order to promote the social integration of the digitalisation of Perusahaan Mikro, Kecil Dan Sederhana (PMKS), the equivalent of Micro Small and Medium Enterprise (MSME).

For example, although some employers have embraced digitalisation, it is evident that their staff is somewhat hesitant to fully embrace this change. In order to address this issue, it is recommended that KPDN, through the assistance of MAMPU (Malaysian Administrative Modernisation and Management Planning Unit), takes the initiative to educate Point of Sale (PoS) and Inventory Management (IM) Solution Providers on the need to revamp their software's Standard Operating Procedures (SOP) and Manuals to be written in both English and Bahasa language. By doing so, this will provide a more user-friendly experience for individuals operating the software, thereby making the transition to digitalisation much smoother and more efficient.

A recommendation is made to other researchers to delve into the challenges faced by individuals who exhibit a lack of enthusiasm in utilising Inventory Management (IM) software. It is observed that these users appear to be overwhelmed by the complexities associated with the IM software. Furthermore, it is crucial to conduct further investigation into the practices of micro businesses that still adhere to traditional manual methods of inventory management. This exploration is warranted as the economic scale may prove to be a significant factor, whereby an increase in IM customers would subsequently lead to a decrease in the cost of acquiring the IM system. Consequently, there arises a need to thoroughly examine the technology adoption processes employed by these micro businesses in embracing IM. By doing so, a comprehensive understanding of the challenges faced by such businesses can be attained.

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