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Using Power BI to Analyse Withdrawals from Company Dispensing Machines

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Abstract: This paper describes the design, development and deployment of an interactive Power BI report intended for the finance department of a manufacturing company. The report analyses material withdrawals from in-plant dispensing machines and relates them to monthly production hours at the cost centre level. A complete workflow is presented, including data acquisition from multiple Microsoft Excel sources, data cleaning and transformation, construction of a relational data model, and the definition of key metrics using Data Analysis Expressions (DAX). The resulting solution comprises a set of report pages for (i) comparing total withdrawals with production hours over time and (ii) analysing withdrawals by valuation class and withdrawal frequency, including identification of the most frequently withdrawn items. To address confidentiality and compliance with the General Data Protection Regulation (GDPR), cost centre names were anonymised, and financial values were intentionally blurred in the presented screenshots. The case study demonstrates how a self-service BI tool can reduce manual processing, improve transparency of key indicators and support timely decision-making in financial controlling.

Keywords: business intelligence; Power BI; DAX; ETL; cost centre; production hours; industrial vending machine; financial controlling

1. Introduction

Business Intelligence (BI) encompasses processes, methods and technologies that transform raw organisational data into information supporting managerial decision-making [1]. Modern self-service BI platforms, such as Microsoft Power BI, enable users to connect to heterogeneous data sources, transform and model data, and publish interactive dashboards and reports [2]. The increasing adoption of BI reflects the broader evolution of data-driven management and the growing availability of digital data in organisations [3]. In manufacturing and logistics practice, BI supports the evaluation of business indicators across multiple organisational dimensions, thereby providing a basis for controlling activities and performance management [4, 5]. A generic BI architecture is illustrated in Figure 1.

Power BI provides an integrated environment for data preparation, modelling and visualisation, with guidance available in the specialist literature and in official documentation [6, 7]. In typical deployments, report authors create reports in Power BI Desktop and subsequently publish them to the Power BI service for distribution to end users [8, 9]. The three core components of Power BI are summarised in Figure 2.

This paper presents a case study from the Daimler Buses Czech Republic Ltd. company, focusing on the development of a Power BI report for the finance department. The aim was: (i) to quantify and monitor material withdrawals from in-plant dispensing machines in relation to monthly production hours and (ii) to analyse the structure of withdrawn items by valuation class and withdrawal frequency to support cost control and

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operational decision-making. The paper documents the implementation workflow and summarises practical lessons learned for similar applications.

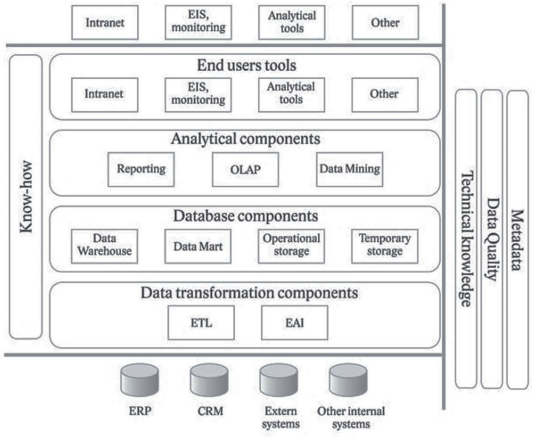


Figure 1: General concept of BI architecture [1].

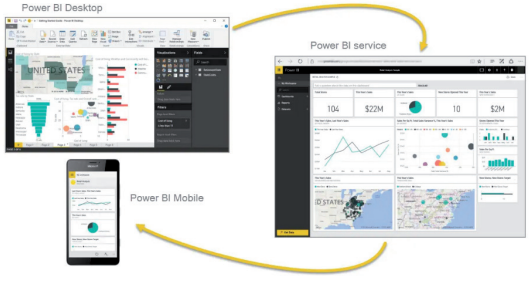


Figure 2: Three components of Power BI [7].

2. Experimental Materials and Methods

2.1. Data sources

The report was developed using datasets provided in multiple Microsoft Excel files. The inputs comprised: (i) monthly totals of production hours for each cost centre (two files covering parts of 2024 and 2025), (ii) a list of cost centres with their codes and responsible managers, (iii) a reference list of valuation classes used to categorise items, and (iv) detailed transaction records of withdrawals from dispensing machines, including the machine identifier, item code and name, employee identifier and name, cost centre, production centre, number of packages, pieces per package and total number of pieces. An excerpt from the withdrawal transaction file is shown in Figure 3.

2.2. Data preparation and modelling

All data sources were imported into Power BI Desktop, where initial data profiling and consistency checks were performed. Incomplete records were removed, and the data were transformed to appropriate data types, additional calculated columns were created where required for subsequent analysis. A relational data model was then constructed, and the necessary relationships between tables were defined to enable cross-filtering across report pages.

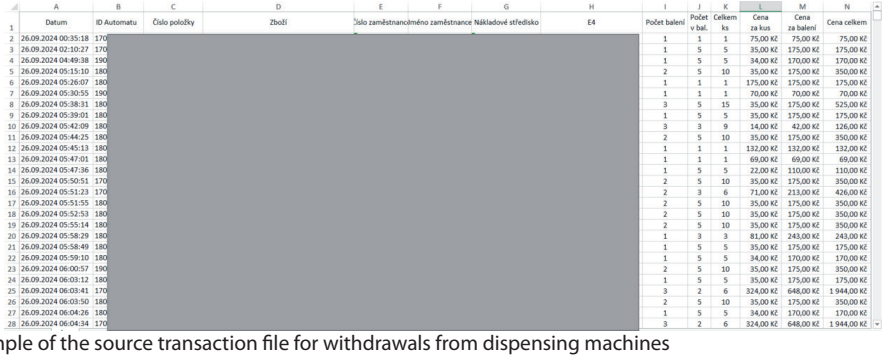
The applied workflow follows the BI principle of multidimensional analysis supported by an Extract–Transform–Load (ETL) process, which ensures the transfer and transformation of primary data into structures suitable for analytical processing [3, 5].

2.3. Metrics and DAX calculations

Two groups of key indicators were implemented. First, total withdrawals from the dispensing machines were compared with total production hours per calendar month and per cost centre. Second, withdrawals were aggregated by valuation class to support a value-based perspective and to identify the most frequently withdrawn items. Key measures were implemented in Data Analysis Expressions (DAX), including a measure for month-to-month changes in the ratio between withdrawals and production hours.

2.4. Data protection considerations

Because the report contains sensitive operational and financial information, the report outputs were prepared in compliance with the General Data Pro-



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Datum	ID Automatu	Číslo položky	Zboží	Číslo zaměstnance	Jméno zaměstnance	Nákladové středisko	E4	Počet balení	Počet v bal.	Celkem ks	Cena za kus	Cena za balení	Cena celkem
2	26.09.2024 00:35:18	170	[redacted]						1	1	1	75,00 Kč	75,00 Kč	75,00 Kč
3	26.09.2024 02:10:27	170							1	5	5	35,00 Kč	175,00 Kč	175,00 Kč
4	26.09.2024 04:49:38	190							1	5	5	34,00 Kč	170,00 Kč	170,00 Kč
5	26.09.2024 05:15:10	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
6	26.09.2024 05:26:07	180							1	1	1	175,00 Kč	175,00 Kč	175,00 Kč
7	26.09.2024 05:30:55	190							1	1	1	70,00 Kč	70,00 Kč	70,00 Kč
8	26.09.2024 05:38:31	180							3	5	15	35,00 Kč	175,00 Kč	525,00 Kč
9	26.09.2024 05:39:01	180							1	5	5	35,00 Kč	175,00 Kč	175,00 Kč
10	26.09.2024 05:42:09	180							3	3	9	14,00 Kč	42,00 Kč	126,00 Kč
11	26.09.2024 05:44:25	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
12	26.09.2024 05:45:13	180							1	1	1	132,00 Kč	132,00 Kč	132,00 Kč
13	26.09.2024 05:47:01	180							1	1	1	69,00 Kč	69,00 Kč	69,00 Kč
14	26.09.2024 05:47:36	180							1	5	5	22,00 Kč	110,00 Kč	110,00 Kč
15	26.09.2024 05:50:51	170							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
16	26.09.2024 05:51:23	170							2	3	6	71,00 Kč	213,00 Kč	426,00 Kč
17	26.09.2024 05:51:55	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
18	26.09.2024 05:52:53	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
19	26.09.2024 05:55:14	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
20	26.09.2024 05:58:29	180							1	3	3	81,00 Kč	243,00 Kč	243,00 Kč
21	26.09.2024 05:58:49	180							1	5	5	35,00 Kč	175,00 Kč	175,00 Kč
22	26.09.2024 05:59:10	180							1	5	5	34,00 Kč	170,00 Kč	170,00 Kč
23	26.09.2024 06:00:57	190							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
24	26.09.2024 06:03:12	180							1	5	5	35,00 Kč	175,00 Kč	175,00 Kč
25	26.09.2024 06:03:41	170							3	2	6	324,00 Kč	648,00 Kč	1 944,00 Kč
26	26.09.2024 06:03:50	180							2	5	10	35,00 Kč	175,00 Kč	350,00 Kč
27	26.09.2024 06:04:26	180							1	5	5	34,00 Kč	170,00 Kč	170,00 Kč
28	26.09.2024 06:04:34	170							3	2	6	324,00 Kč	648,00 Kč	1 944,00 Kč

Figure 3: Example of the source transaction file for withdrawals from dispensing machines

tection Regulation (GDPR). In the figures presented in this paper, cost-centre names were anonymised, and financial values were intentionally blurred or colour-modified to avoid unintended disclosure of confidential data.

3. Results and Discussion

3.1. Report structure and navigation

The final Power BI solution consists of nine report pages organised into two main analytical parts: (i) comparison of withdrawals with production hours, and (ii) analysis by valuation class and withdrawal frequency. An introductory page and a navigation hub were implemented to support users with different levels of experience. Navigation relies on action buttons (home, back and reset filters) embedded consistently across pages. The page structure is summarised in Figure 4, while the introductory/navigation interface is presented in Figure 5.

Figure 4: Overview of report pages (tabs) in the developed Power BI solution (nine pages)

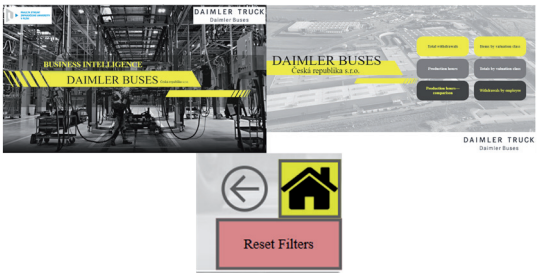


Figure 5: Introductory and navigation interface of the report: (a) Intro page, (b) navigation hub, (c) standard action buttons (back, home, and reset filters)

3.2. Comparison of withdrawals and production hours

For month-level monitoring, a matrix view summarises withdrawals for each cost centre and its responsible manager, with interactive slicers enabling filtering by year, month and leader. A dedicated page provides a comparable overview of production hours, and an additional comparison page enables cross-year comparison of monthly production hours. A combined view relates withdrawals to production hours and highlights changes in the withdrawals-to-hours ratio compared with the previous month via a DAX-based indicator. If the previous month is not included in the underlying dataset, the change indicator can report an artificial decrease. This limitation should be considered during interpretation. Representative report screenshots are shown in Figure 6.

3.3. Analysis by employee and valuation class

To support more detailed investigations, withdrawals can be analysed at the employee level through expandable hierarchies. A combined chart links a time series of total withdrawals with a bar chart showing monthly totals. When a user selects an employee, cost centre, or manager, the chart recalculates and highlights the selected subset relative to the total. Additional pages aggregate withdrawals by valuation class and provide a TOP

Figure 6: Report pages for monitoring withdrawals and production hours (from left): (a) total withdrawals by cost centre, (b) production hours, (c) comparison of production hours, (d) withdrawals versus production hours with a DAX-based change indicator

10 list of the most frequently withdrawn items for the selected period, supporting inventory and category optimisation. Figure 7 provides representative screenshots of these pages.

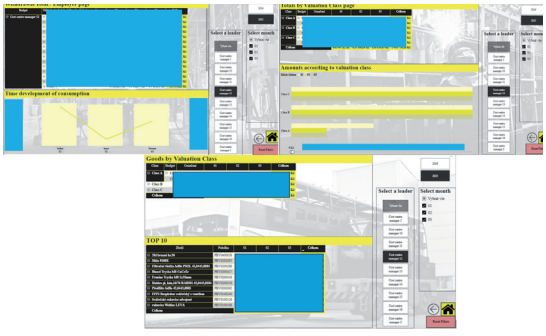


Figure 7: Report pages for detailed analysis (from left): (a) withdrawals by employee with time trend, (b) totals by valuation class, (c) items by valuation class, including a TOP 10 list of the most frequently withdrawn items

3.4 Verification and user feedback

The functionality of slicers, action buttons, cross-visual interactions and DAX calculations was verified for each report page under multiple filtering scenarios. A brief user guide was provided to the company to support maintenance and future enhancements of the solution [10]. Feedback from end users in the finance department confirmed improved orientation in the data, faster comparisons of historical periods and easier identification of trends and deviations.

3.5 Practical benefits and future development

The implementation reduced manual preparation of financial summaries, thereby decreasing the time required to produce monthly overviews and reducing the risk of errors associated with manual data handling. The report provides a consistent and auditable information source, and its modular design allows future extensions (e.g., regular loading of new datasets, adaptation of year-to-year comparisons, or expansion to additional organisational areas such as logistics).

4. Conclusions

A Power BI reporting solution was developed for analysing withdrawals from in-plant dispensing machines and relating them to production performance as represented by production hours. The case study demonstrated an end-to-end workflow from data acquisition and transformation to modelling, DAX-based metric definition and interactive visualisation.

The resulting report supports financial controlling by providing month-level monitoring, cross-year comparisons and detailed views by employee and valuation class. The approach can be transferred to similar manufacturing settings, provided that data governance and confidentiality requirements are addressed during deployment

Acknowledgments

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