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The Foundation of Data-Driven Decisions: Why Data Quality Matters

Bharath Kishore Gudepu[1]

[1]Computer Information Systems, University of Central Missouri, 511 S Holden St, Warrensburg, MO 64093

Abstract

The decision-making process relies on assumptions, premises, and background, all of which are directed by the objective linked to the choice. The backdrop and assumptions reflect external factors beyond the control of any decision-maker, whereas the premises and knowledge of the firm rely on our data. A prevalent conceptual error arises from the misconception between data and information, which are fundamentally distinct notions. In other words, we can collect data from several heterogeneous sources; yet, there is no guarantee that the data will be consistent, comparable, and traceable. This study discusses the significance of measuring and assessment in connection to data-driven decision-making. Subsequently, we outline the ramifications of intuition-driven decision-making and their potential societal consequences. Ultimately, a case study about the monitoring of business processes at the Autarchic Institute of Housing (La Pampa, Argentina) is presented to illustrate the implementation of principles associated with data-driven decision-making.

Keywords: Data Quality, Data-Driven Decisions, Data Governance, Data Management, Business Intelligence, Data Accuracy, Data Profiling, Metadata, Compliance, Data Integrity, Big Data, Analytics, Data Cleansing, Enterprise Data, Decision-Making

Introduction

The decision-making process relies on assumptions, premises, and background, all of which are directed by the objective of the choice itself. The backdrop and assumptions reflect external factors outside the control of any decision-maker, but the premises and knowledge of the enterprise rely on our data, since they are integral to our organizational framework. A prevalent conceptual error arises from the misconception between data and information, which are fundamentally distinct notions. In other words, we can collect data from several heterogeneous sources; nevertheless, there is no assurance that the data will be consistent, comparable, and traceable. In this context, to make a judgment, we must understand the thing under examination and its relevant information at that specific moment. It is essential, from the perspective of general system theory, to identify the system in order to delineate its borders, context, subsystems, feedback, inputs, and outputs. Upon identifying the system, we may proceed with the quantification of each linked attribute to gain detailed insights [1].

To understand the thing under investigation, it is essential to measure it in order to quantify its related properties, from which we may construct the indicators for interpreting the value of each metric. The Measurement and Evaluation (M&E) process can be enhanced by a conceptual

framework grounded on an underlying ontology. The M&E framework facilitates the definition of essential ideas for conducting a measurement procedure in a consistent and repeatable manner.

While it is essential for a measuring procedure to yield reliable, comparable, and traceable findings, the automation of this process is equally crucial. In the contemporary economy, activities occur in real time; thus, it is imperative to seriously contemplate online monitoring for the detection and prevention of various problems instantaneously. In this regard, the measurement and assessment frameworks serve as a crucial asset, since they provide structure and automate the measuring process consistently [2].

Once it is feasible to ensure that the metrics are comparable, consistent, and traceable, the decision-making process will inherently rely on their historical data. In this regard, Organizational Memory assumes special significance, as it facilitates the retention of organizational experience and knowledge for future suggestions (i.e., serving as a basis for assumptions, premises, among others). The Organizational Memory is constantly enriched by metrics and their corresponding experiences, serving as the foundation for feedback in the decision-making process.

Nonetheless, Organizational Memory is a model, and hence, there may be no advice or experiences applicable to a novel circumstance, such as a natural catastrophe. Remembering is crucial, as measurement and assessment methods concerning infrastructure in smart cities may yield incomplete data due to the likely absence of prior recordings. The final example is the city of Santa Rosa (La Pampa, Argentina), where, despite prior knowledge with rainfall levels, no measures could be implemented when the city received a volume of water similar to that of an entire year within a single week.

This invited session addresses the impact of data and information on the decision-making process. Furthermore, we emphasize the measurement and assessment process as a crucial asset for understanding the entities under investigation (e.g., a business process, an individual, a system, etc.), their settings, and the methods by which the process may be automated. We emphasize the function of Organizational Memory as a knowledge repository for suggestions [3].

The Significance of Measurement and Evaluation

To initiate a debate, it is necessary to interrogate the concepts and their applications. In other words, what occurs if we fail to measure? What is the necessity of measurement? What are the advantages? Common sense in engineering dictates that we must describe a notion or object to understand its physical and abstract attributes. Once we ascertain each attribute, it is beneficial to quantify them for analyzing behavior in various contexts. Consequently, by the analysis of each scenario, we can effectively distinguish between normal and abnormal situations, which is helpful in identifying and mitigating undesirable outcomes. The avoidance of certain scenarios and the optimization of resources provide a compelling social and economic perspective as a favorable reason for measurement. In every instance, the issues related to information quality remain a prominent area of research. Measurement facilitates the quantification of the attributes of the thing being analyzed, such as a system or component. However, we must pay special attention to the principles associated to the measuring procedure to ensure uniformity. The measurement is valuable just when the measures are consistent, comparable, and the measuring technique is repeatable. Consequently, we

must maintain a uniform understanding of the ideas of measurements, metrics, indicators, and others. In this regard, the measurement and evaluation frameworks are particularly significant, as they enable us to establish a consensus on the ideas to be utilized throughout the measurement process, so facilitating communication and preventing misunderstandings [4].

For instance, to assess an organization as a system, we may employ the Balanced Scorecard framework by Kaplan and Norton, the Goal-Question-Metric methodology, or the C-INCAMI framework, which stands for Context, Information Need, Concept Model, Attribute, Metric, and Indicator, among others.

Each strategy may possess benefits and weaknesses, contingent upon the context in which they are applied. Regardless of the selected method, it is essential to maintain consistency throughout time in our measurement methodology to ensure the reliability and comparability of ideas and metrics [5].

According to ISO 25.012, data quality encompasses attributes that pertain solely to the data itself, including correctness, completeness, consistency, credibility, and currentness. Nonetheless, there are other attributes that are contingent upon both the data and the system, including accessibility, compliance, secrecy, efficiency, and precision, among others.It is crucial to emphasize that the data constitutes a component of the system, and the quality of the data is influenced both by the data itself and by the system that processes it [6].

Data-driven decision-making may be described as the technique of making decisions based on data analysis rather than solely on intuition. In this regard, it is evident that if decision-making relies on data, subpar data quality would adversely impact the decision-making process. Consequently, monitoring at each phase of the data life cycle is crucial. In other words, we must implement policies within the company to oversee data gathering, processing, analysis, preservation, and reuse or deletion.In this context, there are noteworthy ideas concerning various viewpoints on the requisite procedures for maintaining data quality, including the data maturity model from the CMMI Institute and the CALDEA model derived from maturity models [7].

Returning to the section's outset, what is the use of measurement? It is beneficial for understanding the entity under examination. The measurement delineates the collection procedure and is closely linked to data acquisition throughout the data life cycle. Consequently, if we focus on the instant data is collected, we have a significant opportunity to enhance the subsequent stages of the life cycle. In other words, if we could reduce the likelihood of data errors at the source, we may then diminish the impact of error propagation in the subsequent phases of the life cycle.This would enable us to mitigate the risks related to data quality (e.g., consistency) while making judgments based on the data [8].

However, the measurement pertains to the methodology of obtaining the measures, rather than their interpretation. For instance, regarding C-INCAMI, the assessment entails the formalization of organizational knowledge via the decision criteria included into the indicators. Thus, each indicator possesses sufficient ideas for understanding the values of the corresponding metric and for drawing conclusions based on organizational knowledge.

Consequently, the sequence in which we establish the measurement and evaluation method is crucial, and for this reason, we may use approaches such as GOCAME [9].

The company takes distinct judgments based on data-driven analysis. The historical context of the data is a crucial asset for facilitating decision-making. Consequently, organizational memories may be utilized to model organizational experiences based on past metrics and assessments. Furthermore, case-based reasoning might be utilized from the organizational memory to enhance recommendations in the decision-making process [10].

The Societal Impact of Data-Driven Decision-Making

A smart city refers to an urban area that combines and monitors essential infrastructure with advanced computers to provide fundamental services to the public. However, the concept of smart cities is not just associated with technical factors, but is also pertaining to elements like as government and economy, among others.

Every choice about the various services or infrastructure in a city should be based on their experiences. By utilizing the city's experiences and data, we may categorize various typical conditions and, subsequently, identify deviations from normality. This is a crucial element for overseeing infrastructure and services inside a city, with the ultimate objective being the prevention of risk scenarios and, in the most adverse circumstances, their real-time identification [11].

The measuring and assessment procedure is essential for assessing the present condition of any service or infrastructure inside the city. If we do not measure, we will remain unaware of the condition of each element. This is essential for guiding data-driven decision-making, as each choice must be informed by the present status of various parts inside the city.

What if we lack the data? The judgments are likely influenced by intuition due to the absence of evidence or records to substantiate the alternative options. The issue with intuition in decision-making is its subjectivity, as there are no records or prior experiences to substantiate the chosen course of action.

When authorities put their decision-making on intuition, the societal repercussions might be catastrophic. The city of Santa Rosa is situated in the province of La Pampa, Argentina. The city employs a pluviometer as a reference for measuring the volume of precipitation during a specific rainfall event. This facilitates data collection but does not enable real-time monitoring of the water levels around the city or the volume of water flowing through the sewers. In March 2017, the city saw a week's rainfall that equaled the annual precipitation volume. Figure 1 illustrates the effects of intuition in decision-making, clearly obvious in the city of Santa Rosa; a picture conveys more than a thousand words.As of the current day, the northern region and the provincial capital of La Pampa continue to endure the repercussions of the flooding. Although natural disasters are challenging to avert, it is feasible to oversee the infrastructure and services across the city to facilitate timely planning of projects. Conversely, the oversight of infrastructures and services might enhance quality of life, foresee calamities, or even preserve individuals' lives [11].

Conclusion

In this invited presentation, we articulated our viewpoint on the significance of measurement and assessment in data-driven decision-making. Regarding data quality and in accordance with ISO 25.012, aspects may depend solely on the data, the system, or a combination of both. In this context, data-driven decision-making relies on data quality among other related criteria (e.g., governance, etc.). Substandard data quality and an inadequate measuring procedure may indicate a deficient decision-making process. Consequently, the Data Management Maturity Model from the CMMI Institute presents a noteworthy option worthy of attention. This presentation highlights the disasters linked to intuition-based decision-making, illustrated via a real instance in Santa Rosa, La Pampa, Argentina, despite the prevalent discourse on the advantages of data-driven decision-making. It is intriguing to quantify and elucidate the good and negative consequences associated with the presence and absence of data-driven decision-making. We give a case study concerning the Autarchic Institute of Housing of La Pampa, whereby the business operations are regarded as the entity under examination. The measuring and assessment technique utilizing C-INCAMI was established to facilitate the decision-making process.

References:

[1] Malhotra, I., Gopinath, S., Janga, K. C., Greenberg, S., Sharma, S. K., & Tarkovsky, R. (2014). Unpredictable nature of tolvaptan in treatment of hypervolemic hyponatremia: case review on role of vaptans. Case reports in endocrinology, 2014(1), 807054.

[2] Shakibaie-M, B. (2013). Comparison of the effectiveness of two different bone substitute materials for socket preservation after tooth extraction: a controlled clinical study. International Journal of Periodontics & Restorative Dentistry, 33(2).

[3] Gopinath, S., Janga, K. C., Greenberg, S., & Sharma, S. K. (2013). Tolvaptan in the treatment of acute hyponatremia associated with acute kidney injury. Case reports in nephrology, 2013(1), 801575.

[4] Shilpa, Lalitha, Prakash, A., & Rao, S. (2009). BFHI in a tertiary care hospital: Does being Baby friendly affect lactation success?. The Indian Journal of Pediatrics, 76, 655-657.

[5] Singh, V. K., Mishra, A., Gupta, K. K., Misra, R., & Patel, M. L. (2015). Reduction of microalbuminuria in type-2 diabetes mellitus with angiotensin-converting enzyme inhibitor alone and with cilnidipine. Indian Journal of Nephrology, 25(6), 334-339.

[6] Gopinath, S., Giambarberi, L., Patil, S., & Chamberlain, R. S. (2016). Characteristics and survival of patients with eccrine carcinoma: a cohort study. Journal of the American Academy of Dermatology, 75(1), 215-217.

[7] Swarnagowri, B. N., & Gopinath, S. (2013). Ambiguity in diagnosing esthesioneuroblastoma--a case report. Journal of Evolution of Medical and Dental Sciences, 2(43), 8251-8255.

[8] Swarnagowri, B. N., & Gopinath, S. (2013). Pelvic Actinomycosis Mimicking Malignancy: A Case Report. tuberculosis, 14, 15.

[9] S Vaezi, (2008). Measurement and Evaluating Frameworks in Electronic Government Quality Management," in 2nd International Conference on Theory and Practice of Electronic Governance, Cairo, Egypt. 160-165.

[10] Becker, P., F Papa, and L Olsina, (2013). Enhancing the Conceptual Framework Capability for a Measurement and Evaluation Strategy," in International Conference on Web Engineering, Aalborg, 104-106.

[11] Thakkar, D., A Hassan, G. Hamann, and P Flora, (2008). A Framework for Measurement Based Performance Modeling," in 7th International Workshop on Software and Performance, Princeton, NJ, USA, 55-66.