Research Report

The Challenge of Data Overwhelm in Modern Enterprises





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At Atomic BI, our mission is to empower SMEs in Southeast Asia to make better business decisions and improve their team performance by integrating AI into their operations. We embarked on this research to explore how businesses can leverage AI alongside human intuition and experience. Then, we wanted to identify how this can lead to improved productivity for SME teams, unlocking more opportunities for growth and success. Our research is organised into 4 sections - and at the end of each section, we extract the next best decisions and actions that you can take in your business.

- 1. We begin with the **biggest challenge SMEs face when it comes to data overwhelm**. Through comprehensive interviews with SME leaders, we uncovered the real issues and provide recommendations to overcome them, so that your data becomes an asset rather than a burden.
- 2. Next, we explore the **limitations of traditional data warehouses** and the benefits of modern, efficient and flexible data systems that are more relevant to the fast-paced decision-making needs of SMEs.
- 3. We then introduce the concept of **signal-based analytics as the next evolution in data analysis.** This approach allows SMEs to cut through the noise, focusing only on the signals that truly matter to your business outcomes. We demonstrate why most of our research participants favour this approach, and the first steps you must take to build a signal-based approach.
- 4. Finally, we delve into the heart of the matter **using Al in a human-first approach.** How can businesses find a harmony between human intuition and machine intelligence, to design powerful systems that truly enhance, rather than replace, human decision-making? We reveal insights from SMEs and recommendations to deploy this successfully in your business.

Our research underscores the potential of AI to transform SME operations in Singapore and how SMEs can best position themselves today with the best practices that combine AI capabilities with human expertise, to drive greater productivity, business growth and success.

O1 Big Data, Big Problems?

Now more than ever, SMEs need to make the right decisions fast, to grow, thrive and win in hyper competitive markets.

With advances in digitisation, automation and widespread data collection, it should be easier to make smarter decisions based on data. And yet, the reality is often the complete opposite.

It's a delicate balance between being comprehensive and being overwhelmed.

Despite its value in guiding business decisions, the "three Vs" of big data - volume, velocity and variety - can lead to a state of data overload. In this chapter, we dive into the comprehensive interviews with numerous SME leaders to uncover the real challenges when it comes to working with data, and explore several recommendations to overcome them.

"The sheer volume of data managed by organisations today continues to grow, with 64% managing at least 1 PB of data and 41% managing at least 500 PB of data."

- AI & IM Report, 2024

Key Takeaways

01

Overwhelming Data

The staggering volume of data collected by organisations makes it difficult to identify what is relevant for decision-making.

02

Lack of Data Skillsets & Methodologies

Current skills, tools and methodologies for data analytics are inadequate, making it difficult to derive useful insights.

03

Poor Data Quality

Aside from quantity, the quality and accessibility of data is often poor, complicating the process to extract insights and make decisions.



<u>Christoph Holz</u> Keynote Speaker Al & Digital Transformation "Even as a computer scientist, I find it overwhelming... I find myself spending more time sifting through data than actually making decisions."

"The challenge is not just the amount of data, but also its quality and how accessible it is for analysis. Poor data quality can lead to incorrect conclusions and bad decisions. It's a multifaceted problem that requires a comprehensive approach to solve."

Approximately how many hours per week do you and your direct reports spend consolidating data for reporting?



"Our roles require us to sift through vast amounts of data from different business units. The challenge is not just in the volume but in ensuring that the insights we derive are relevant and actionable. It's a delicate balance between being comprehensive and being overwhelmed."



Michelle Fu Marketing Manager (APAC) at SB Telecom Singapore

01

Signals from Noise

Simplify your data management infrastructure with tools that automate the identification and prioritisation of Signals¹, so you focus only on data that directly influences strategic decisions, reducing complexity and data overwhelm.

02

Schedule Audits

Implement a routine schedule for data audits to identify and eliminate ROT (redundant, obsolete & trivial) data.

Adopt technologies that support data interoperability and secure access, facilitating smoother analysis and decision-making.

03

Invest in Automation

Invest in specialised training programs for your team to build a strong foundation in information management and Al readiness.

This should cover data archiving, retention, and lifecycle management strategies, allowing for effective AI adoption.



Raphael Lim Head of Marketing at The Royal Albatross

"The volume of data is just too much to handle manually. We need better tools and methodologies to filter out the noise and focus on what's important. Otherwise, we risk getting lost in the data and missing critical insights." "Al offers unprecedented opportunities for automating data analysis and generating insights, which can significantly alleviate the burden of data overwhelm. By leveraging Al, organizations can sift through vast amounts of data more efficiently, identifying patterns and trends that would be impossible to detect manually."

Reference Document: AI Readiness and Information Management

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Atomic BI's Expert Perspective

The Paradox of Data Abundance

Many businesses struggle with balancing data quantity and quality. Collecting too much data leads to time and money lost to make sense of the data. Yet, collecting poor data might be worse, leading to the wrong decisions. So, businesses need to focus on transforming vast data warehouses into meaningful insights that drive strategic action.

Businesses must be willing to adopt and invest in systems and processes that discern signals from noise, plus enhance data usability to drive actions - and AI is at the forefront of the next wave of innovation.

Footnotes:

¹ *Signals* are specific, meaningful pieces of information. Think of them as the key indicators or "signals" that tell you something important about your business, e.g. a sudden drop in sales. See Section 3 for a more detailed evaluation of Signals.

O2 Moving Away from the Data Warehouse

Large companies have utilised Data Warehouses ever since there was the need to integrate data with reporting and decision-making, but are they still relevant today for SMEs - especially with the rise of real-time, scalable cloud solutions?

This chapter looks at the insights gathered from industry experts, weighing the alternative solutions like Data Lakehouses, Cloud Data Warehouses and Data Streaming.

Managing data effectively is a constant challenge. It's not just about having the right tools but also about understanding the context in which data is collected and used. Sometimes, the most significant insights come from connecting dots across seemingly unrelated data sets."

Is it so terrible to abandon Warehouses for a modern approach? We explore a cost-effective, agile approach more suited for SMEs, and how data management does not need to get in the way of data analytics.

Data Warehouses vs Lakes vs Lakehouses

Data Warehouses

 provide fast access to data and SQL compatibility for business users that need to generate reports and insights for decision-making. All data must go through ETL (extract, transform, load) phase. This means it is optimized in a specific format, or schema, based on the use case before it is loaded to support high-performance queries and data integrity. However, this approach limits the flexibility of access to the data and creates additional costs if data needs to be moved around for future use.

Data Lakes

store large amounts of unstructured and structured data in its native format. Unlike data
warehouses, data is processed, cleaned up, and transformed during analysis to enable
faster loading speeds, making them ideal for big data processing, machine learning, or
predictive analytics. However, they require expertise in data science, which limits the set
of people who can use the data, and if they're not properly maintained, data quality can
deteriorate over time. Data lakes also make it more challenging to get real-time queries
as the data is unprocessed, so it still potentially needs to be cleaned, processed,
ingested, and integrated before it can be used.

Data Lakehouses

 merge these two approaches to create a single structure that allows you to access and leverage data for many different purposes, from BI to data science to machine learning. In other words, a data lakehouse captures all of your organization's unstructured, structured, and semi-structured data and stores it on low-cost storage while providing the capabilities for all users to organize and explore data according to their needs.

Source - What is a Data Lakehouse by Google

Key Takeaways

01

The Rise of Real-time

Data warehouses are increasingly being challenged by the rise of real-time, scalable cloud solutions.

02

Lakehouses over Warehouses

The flexibility of data lakes with the structured querying capabilities of data warehouses, offers SMEs a more agile and cost-effective alternative for managing and analysing data.

03

Data Readiness

Effective data management and readiness are critical for leveraging the full potential of data warehouses or their modern alternatives "The challenge of data overload and the inefficiency of traditional data warehousing methods are driving the exploration of alternative data management solutions that prioritise real-time data processing and analytics."

- AI & IM Report, 2024



Manish Chawda Partner at Pragma Singapore

"You have all these systems, nothing talks to each other. So it's all just painful. Especially when you're a small business. (It would be good) if there's

something out there which can kind of consolidate stuff for us and pull data out instead of having a massive data warehouse."

Survey

We asked participants to estimate the cost of implementing a Data Warehouse for their organisation.

Response

The average annual cost came up to S\$61,000.

Survey

Gathering and combining all data in a Data Warehouse is necessary for effective reporting and analytics, and justifies the additional efforts.

Response

65% of participants responded 4 or higher out of 5.

1/5

5/5

Strongly Disagree

Strongly Agree



Pawan Darda CTO of Pelago by Singapore Airlines

Question:

How does your Data Warehouse work in your Organisation?

"We are fortunate to control all the data that flows into the warehouse. So I think a lot of times what happens is if you're not building a platform from ground up, you do not control what event streams different parties are sending you and then you have to come up with a complex common transformation layer... I think early"



Dazri Hanif COO at Devhaus

Question:

Do you use a Data Warehouse model, or a signalling approach of sending only certain events?

"We know there's a lot of things that we could track, but our team's mentality is to just stick to the main quest and not look into every other metric out there possible. At the start, when we plan it out ... we usually take a two week PoC before we actually move into an entire process on its own."

Data Storage & Accessibility

"When asked to select all the places they store data, 87% of survey respondents selected the cloud, but 51% also had data in self-hosted storage and 46% had it in physical documents."



- AI & IM Report, 2024

Recommendations

01

Optimise Data Warehouse for Scalability

Design your data warehouse to easily integrate new data sources and expand as your business grows, using cloud solutions for flexibility and cost savings.

02

Leverage Al

Incorporate AI-driven tools and technologies to automate data analysis, enhance predictive analytics, and generate deeper insights from your data with less time and cost.

03

Implement Proactive Data Quality Management

Set up a program for regular data monitoring and cleansing to maintain high data quality, using automated tools to ensure accuracy and reliability in analytics.



Atomic Bl's Expert Perspective

Navigating the Complexities of Data Storage

The complexities and costs of traditional data warehousing solutions are fast disappearing thanks to the rise of cloud-based platforms.

These platforms offer unprecedented scalability and flexibility, enabling small businesses to consolidate and analyse data from all manners of sources.

Our research and interviews with industry leaders highlight the critical role of data integration in maximising the value of data warehousing investments.

Effective data integration strategies not only streamline data flows and improve data quality but also enhance the overall agility of the organization.

At the same time, businesses must not forget to tackle the issues of data privacy, security and compliance in the cloud.

O3 Signals Over Systems

As we are painfully aware by now, too much data often leads to analysis paralysis. All the more so for SMEs, who are pressured to make decisions faster with less margin for error.

Collecting data, managing data, analysing data and securing data have proven to be too difficult to simplify, leading many SMEs to persist with traditional data systems that are expensive and inefficient, or worse, abandon data strategy altogether.

We propose a paradigm shift towards focusing on key data signals - specific, meaningful data points that directly inform decision-making processes. This approach prioritises relevance and actionability over volume, streamlining data analysis for decision-making, today.

During our research interviews, we gathered qualitative insights into the practical implications and challenges of current data management practices within SMEs... and their sensing towards a signal-based analytics approach.

No surprises, it was a resounding YES! - read on to find out why.

Key Takeaways

01

Decision Lag

SME leaders reported the biggest consequence of data overwhelm was slow and inaccurate decisionmaking, at both the strategic and operational levels.

02

Too Many Tools!

Businesses we surveyed use an average of 16 digital tools, each producing dozens of data points. Integration is seldom seamless, causing more frustration and delays.

03

Signals Please

The concept of signalbased analytics was met with positive anticipation, aligning with SMEs' strategic need for agility. A subset of SMEs had already adopted a focused data analysis approach, with positive impacts to speed and accuracy.



<u>Anusha Varma</u> Subject Matter Expert - Marketing, Strategy & Transformation

"We've suffered from data overload so much in the past. It took us a while to realise that not all data is equally important. Now, we focus on identifying key data points that truly inform our strategic decisions, rather than trying to analyse everything at once."



Manish Chawda Partner at Pragma Singapore

"Decision-making in the context of data overload requires a shift in mindset. It's about prioritising what data matters most and being willing to ignore the rest. This isn't easy, especially in a culture that often equates more data with better decisions."

Lacklustre Integration

How well do your current Business Insight solutions integrate with your various business systems?

Rate the difficulty your organization faces in integrating data from different tools.

Existing solutions for analysing data across different platforms are insufficient and too complicated.



3.2/5

3.1/5

3.3/5

Recommendations

Start using signals!

Data Signals

- **Data signals** are specific, meaningful pieces of information that directly inform decision-making.
- Think of them as the key indicators or "signals" that tell you something important about your business. For example, a sudden drop in sales, an increase in customer complaints, or a spike in website traffic are all data signals.
- These signals help you focus on what really matters and take action quickly.

In Summary

Key pieces of information that are directly useful for making decisions.

Pros

- Reduce time & effort to filter out irrelevant data
- Provide clear, concise and insightful info for faster action

Cons

- Relies heavily on the accuracy and relevance of only the selected signals
- Requires careful selection of key signals and may not scale well for businesses with complex data needs

Data Systems

- Data Systems are the comprehensive frameworks or warehouses where all your data is stored and managed.
- These systems collect and organise vast amounts of data from various sources.
 While they provide a complete picture, they can be overwhelming because they include every piece of data, not just the critical signals.
- This can make it harder to find the actionable insights you need to make key decisions fast.

In Summary

Large, comprehensive collections of all your data, which can be overwhelming and harder to navigate.

Pros

- Provides a complete picture with broader context, useful for in-depth analysis
- Can be used for various types of analysis, from operational to strategic

Cons

- Requires significant time, costs and specialised skillsets to manage, analyse, and can lead to data overload
- Sheer volume of data can delay decision-making

The First Steps to Transition from Systems to Signals

01

Identify Key Signals

Organisations should start by identifying the most critical data points relevant to their strategic goals and operational needs. This requires a clear understanding of what drives value and what information is necessary for decision-making.

02

Less Data, More Efficient

While it is tempting to believe that more data is better, by focusing only on key signals, companies can simplify their data architecture, reducing the need for complex integrations and extensive data warehousing.

03

Cultivate an Outcome-Driven Mindset

Encourage teams across the organisation to think in terms of Outcomes, Results & Key Metrics rather than gathering all the data out there. This includes training on identifying and using key data points effectively.



AtomicBI's Expert Perspective

A Clear Signal for Effective Decision-Making

The shift towards signal-based analytics could represent the next evolution in how organisations approach data analysis.

Our discussions with industry experts underscore the potential of signal-based analytics to cut through the noise of data overload.

By focusing only on the signals that truly matter to business outcomes, SMEs can be empowered to make faster and more informed decisions.

However, this transition requires a cultural shift that values precision and relevance over sheer volume. Importantly, the business' strategy and key objectives must also be aligned at all levels of the organisation.

04 Human Intuition & Machine Intelligence

Every business we spoke to agreed how vital it is to preserve the human element in data. After all, people represent the beginning and end of our data journey; data is gathered from humans, and humans make decisions based on the data.

Coupled with the unparalleled capabilities of AI in processing and analysing vast amounts of data, we must find a harmony between the two. We can't expect to just turn on an 'AI switch' and have everyone in your company handover their workflows to AI.

This chapter delves into the integration of data systems and AI applications. Based on our interviews with SME leaders, we seek to design systems that not only leverage the full potential of AI, but also remain intuitive and supportive of human decisionmaking processes.



Allan Lund Hansen CPO at Braveno

"You can use the analogy of selfdriving cars. We've all seen videos of a guy sitting in his Tesla sleeping behind the wheel. It's not like the car has true high level driving capabilities - these people have driven the same route over and over again on the way to work or something. And they've seen over and over that it's driving fine, so they get more and more comfortable. And in the end, they ease into it, kind of by giving themselves this notion of security."

"Most organisations reported not giving decisionmakers access to the data held by the company, despite acknowledging that people make better decisions when this data is made available."

- Alteryx - The Decision-Making Technologies Shaping the Future of the Enterprise, 2023

Key Takeaways

01

Human-First

Systems designed with a human-first approach lead to higher levels of engagement across all organisational levels. This fosters a culture of inclusivity and informed decision-making.

02

Securing Buy In

Our research shows that training and adoption are key factors of whether a new tool improves results - all the more so for such a big leap in technology like AI. Oftentimes, the reluctancy of senior staff in using new tools halts attempts in its tracks.

03

Ease of Access

Even with perfect data quality, complex systems often result in humans reverting to old habits. The process of data analytics needs to be seamless with as much friction eliminated as possible. "I think one of the things that we measure very closely is really the training and adoption. So sometimes when we spend a lot of money in a new tool and when the staff are not using it, or if they are not collecting the data in a certain format that we would like them to, this will also affect how we interpret the results."

- Michelle Fu Marketing Manager (APAC) at SB Telecom Singapore

"I find myself spending more time sifting through data than actually making decisions. The interface is cluttered, and it's hard to find what I need quickly. This is a common issue with many data tools out there."

- Christoph Holz Keynote Speaker AI & Digital Transformation

"There's a point where I go, okay, I'm giving up. There's no point showing me data or giving me analysis because you guys are getting it wrong, and I got better things to do."

- Manish Chawda Partner at Pragma Singapore

"I think the problem is more human focused. I mean even if the data is given to them on a nice silver plate... the issue is that humans do not know how to come up with correct hypothesis. It is a core intuition problem, which is a skill gap"

- Pawan Darda CTO of Pelago by Singapore Airlines "Eighty-eight percent of survey respondents report facing 'issues with data accuracy, data integrity, and data excess.' This is especially concerning because AI success is largely dependent on the quality and accuracy of the data it relies upon."

"Despite AI already supporting an average of 25% of survey respondents' work, only 43% of organisations express high confidence in the accuracy of their AI output."

"Sustainable, responsible, and successful Al requires information management."

- Key quotes about Al Al & IM Report, 2024



Recommendations

01

Democratise Data

The focus needs to be on ensuring tools and workflows are intuitive and accessible, reducing the barrier to entry for individuals with varying technical expertise. This paves the way for decisionmaking to truly be datadriven at all levels of the organisation.

02

Foster a Data-Inclusive Culture

Build and nurture a culture where data usage is valued and supported through training and resources. This ensures all team members can effectively utilise AI tools and are actually communicating and reasoning with data.

03

Good Data In, Good Data Out

As one of our interviewees put it, "Even with the best Al brain interpreting your data, if the data is bad, the result will be crap." Fix your data quality and workflows first, before enhancing with Al.

All-Hands Approach

AtomicBI's Expert Perspective We have to start with the humans in our organisations first. By empowering teams with a strong foundation of data literacy - the ability to read, understand, analyse, communicate and reason with data - your organisation can truly become data-driven.

Then, the obvious method to implement with speed and agility is to utilise AI throughout your data workflows, all the way from deciding which inputs to capture, up to providing decisions and recommendations as your very own business oracle.

It's impossible to ignore the powers of AI in deploying technology and improving productivity - just don't forget to build a strong, human foundation first.

Pilot Program

Unlock a 25%+ Increase in Productivity with AI and Automation with Atomic BI

Atomic BI is offering an exclusive pilot program for established SMEs and recently funded Start-Ups based in Singapore. This program qualifies for <u>EDG support (Enterprise</u> <u>Development Grant)</u>, for Automation and Process Redesign applications under the Innovation & Productivity category.

Why Join?

- Boost Productivity: Achieve a 25%+ increase in productivity within 90 days.
- Adopt AI: Learn and truly adopt AI and automation to keep your business ahead, without sacrificing your human expertise.
- Expert Guidance: Participate in a Growth Discovery Workshop to uncover and address business challenges.
- **Deploy a Signal-Based Approach:** Identify the key signals that drive your business, and build an AI-powered dashboard to integrate, display and deliver insights that truly matter.
- **Tech Partnership:** Leverage Atomic BI's expertise in AI, automation and custom development to develop your own in-house AI Assistants that are trained on your specific business.
- Shape the Future: Influence the development of Atomic BI with your feedback.

Program Overview:

- Duration: 3 Months (90 Day Express Delivery)
- Steps:
 - a. Conduct a Growth Discovery Workshop to map your Customer Journey and evaluate the costs and time implications of business challenges.
 - b. Receive a detailed Project Plan and Pilot Project Proposal.
 - c. Deliver the first productivity result within 90 days.

Expected Benefits:

- Increased Productivity: Automate tasks and processes to save time.
- **Cost Efficiency:** Achieve more with fewer resources.
- Streamlined Data Analysis: Reduce data overwhelm and focus on strategic tasks.
- Better Decision Making: Make faster, informed decisions with high-quality data.
- Enhanced User Engagement: Tailor experiences and interactions more effectively with Al-driven insights.

Success Story: Using Atomic BI, MagLoft (a tech SaaS business) reduced the time spent on sales outreach by 83%, from 3 hours to 30 minutes per 20 leads processed, while increasing response rates significantly.

Application Process

- Eligibility: Must use at least 3 cloud-based solutions and be a registered business in Singapore.
- Deadline: July 31st Limited to 3 spots.

For more details, contact us at dan.malone@atomic.bi

Apply Now

https://app.atomic.bi/link/pilot/



As we draw our extensive research to a close, we reflect on the key findings and action items that have emerged.

Our exploration of data analytics within SMEs has highlighted both significant hurdles and exciting opportunities. It is a pivotal time for SMEs to update their data strategies if they don't want to get left behind without AI-powered efficiencies.

For your convenience, we've compiled a list of the key insights that SMEs can use to fully leverage data and AI to drive strategic decision-making and productivity:

Key Findings

Data Overwhelm and Decision Lag: The vast amounts of data collected by SMEs often leads to slow and inaccurate decisionmaking, affecting both strategic and operational levels.

Integration Challenges: Current business intelligence solutions struggle to integrate effectively with various business systems, leading to fragmented data and inefficiencies.

Human-First Design: Systems designed with a human-first approach lead to higher engagement levels and foster a culture of inclusivity and informed decision-making.

Recommendations

Streamline Data Architecture: Focus on key signals that drive value and are necessary for decision-making. For example, instead of collecting all customer interaction data, prioritise key metrics like customer satisfaction scores and purchase frequency.

Improve Data Integration: Invest in cloudbased platforms that offer scalability and flexibility. This will enable seamless data consolidation and analysis from various sources, enhancing overall data quality and agility.

Adopt a Human-First Approach: Design systems that are intuitive and supportive of human decision-making processes. This will lead to higher engagement and a culture of trust and inclusivity. **Al and Data Literacy:** Empowering teams with data literacy and Al tools is essential to be truly data-driven.

Promote Data Literacy: Build a strong foundation of data literacy within your organisation. Provide training and resources to ensure all team members can effectively utilise AI tools and communicate with data.

Signal-Based Analytics: Prioritising key signals rather than overwhelming data volumes can simplify data architecture and enhance decision-making speed and accuracy. Leverage AI for Predictive Analytics: Incorporate AI-driven tools to automate data analysis and enhance predictive analytics. This will generate deeper insights from your data with less time and cost.

The insights and recommendations presented in this report highlight the transformative potential of data and AI for SMEs.

Businesses must utilise AI to address the challenges of data overwhelm, integration, and literacy, to unlock new levels of productivity and strategic decision-making.

Look at it this way. The world's newest digital vehicles - Artificial Intelligence - is fueled by data. Harness both with a human-first approach, and your business will unlock unprecedented benefits.

06 Study Methodology

To ensure a comprehensive understanding of the challenges and opportunities faced by SMEs in Singapore, we employed a multi-faceted research approach. Our methodology included both qualitative and quantitative data collection and leveraged the capabilities of Atomic BI as a Research and Analysis Tool.

Qualitative Research Interviews

We conducted 25 in-depth qualitative research interviews with SME leaders across various industries in Singapore. Each interview lasted up to one hour, providing ample time to delve into the specific challenges and needs of each participant. Our interview questions were meticulously crafted based on our research hypotheses, encompassing both problem and solution hypotheses. This approach allowed us to gather rich, detailed insights directly from the decision-makers and practitioners within SMEs.

Survey

In addition to the qualitative interviews, we conducted a survey to gather quantitative data. We received approximately 30 responses, providing a robust dataset to complement our qualitative findings. The survey responses helped validate our hypotheses and provided a broader perspective on the issues faced by SMEs.

Data Analysis with Atomic Bl

To analyse the collected data, we utilised Atomic BI as our primary Research and Analysis Tool. Atomic BI enabled us to efficiently manage and interpret both qualitative and quantitative data. We employed a Retrieval-Augmented Generation (RAG) approach, which combines the strengths of traditional data retrieval methods with the generative capabilities of AI. This approach allowed us to generate insights and identify patterns within the data.

Importantly, we ensured the accuracy and reliability of our findings by manually reviewing all AI-generated insights. This step was crucial in verifying the conclusions drawn from the data and ensuring they accurately reflected the realities faced by SMEs.

By combining qualitative interviews, quantitative surveys, and advanced data analysis techniques, our research approach provided a comprehensive and nuanced understanding of the SME landscape in Singapore. This robust methodology underpins the insights and recommendations presented in this report.

O7 Limitations of the Report

In conducting this research, several limitations were encountered that may have impacted the comprehensiveness and accuracy of our findings. It is important to acknowledge these limitations to provide context for the results and to guide future research efforts.

Detailed Limitations

- 1. Data Access Limitations: We encountered difficulties in obtaining proprietary data from some SMEs in the industry. This limitation may have restricted the comprehensiveness of our findings.
- **2. Time Constraints:** The research was conducted within a tight three-month timeframe, which limited the depth of our analysis. Additionally, data collection was constrained by the limited availability of SME leaders during the end-of-year period.
- **3. Sample Size:** The survey included responses from 30 SMEs. The smaller sample size may affect the generalisability of the results.
- **4. Cultural Bias:** The majority of our respondents were from SMEs based in Singapore and Australia, with a few from Europe and North America. This geographic concentration may introduce a cultural bias in the findings.
- **5. Statistical Issues:** Inconsistent data formats posed challenges during data normalisation, affecting the analysis. Additionally, missing data in certain responses impacted the reliability of some of our statistical analyses.
- **6. Survey Design Limitations:** The question on the human component of technology was met with some confusion by participants and required clarification by the moderator. This may have influenced the responses.
- **7. Operational Constraints:** Data security and protection were barriers to interviewing some respondents, who required internal management and legal approvals to participate.
- **8. Manual Data Handling:** Manual data collection often suffered from data quality issues or could be missing completely, leading to inaccurate data.

While these limitations present challenges, they also offer valuable insights for future research. Addressing these issues can enhance the robustness and reliability of subsequent studies, ultimately contributing to more informed decision-making within the SME sector.

O8 List of Sources

Туре	Source	Name	Year
Report	Singapore Business Federation	National Business Survey	2024
Report	Smart Nation Singapore	Singapore National AI Strategy 2.0	2023
Report	Wavestone	Data and AI Leadership Executive Survey	2024
Report	Forrester	Predictions 2024	2024
Report	Snowflake	DATA + AI PREDICTIONS 2024	2024
Report	Dun & Bradstreet Singapore	ASEAN SME Transformation Journal	2022
Report	PWC	2023 Cloud Business Survey	2023
Report	Gartner	Gartner Magic Quadrant for Data Integration Tools	2023
Report		Gartner Magic Quadrant for	2023
		Analytics and BI Platforms	
Report	Alteryx	The Decision-Making Technologies Shaping the	2023
Data	Data	Research Interview Survey Data	2024
Article	MITSIoan	Five Key Trends in AI and Data Science for 2024	2024
Article	PWC	2024 AI Business Predictions	2024
Article	PWC	Transform Information into Insight with Data Analytics	2020
Article	IRMJ	Data Analytics in Small and Medium Enterprises	2022
Article	Alteryx	Analytics Maturity Snapshot	2023
Article	Alteryx	Drive Value, Build Confidence	2023
Article	Alteryx	The Top Data and Analytics Trends for 2024	2023

O9 Glossary of Terms



Glossary

A

- Al (Artificial Intelligence): Technology that enables machines to mimic human intelligence, such as learning, reasoning, and problem-solving.
- **Al Readiness:** The preparedness of an organization to adopt and implement Al technologies effectively.
- **Automation:** The use of technology to perform tasks without human intervention, increasing efficiency and reducing errors.

В

- **Big Data:** Large and complex data sets that require advanced tools and techniques to store, process, and analyze.
- **Business Intelligence (BI):** Technologies and strategies used by enterprises for data analysis and management of business information.

С

• **Cloud Solutions:** Internet-based computing services that provide scalable and flexible resources for data storage and processing.

D

- Data Analysis Overhead: The extra effort and resources required to process and analyze data.
- **Data Archiving:** The process of moving data that is no longer actively used to a separate storage system for long-term retention.
- **Data Cleansing:** The process of detecting and correcting (or removing) corrupt or inaccurate records from a data set.
- **Data Compliance:** Adherence to laws and regulations governing data usage and protection.
- **Data Integration:** The process of combining data from different sources to provide a unified view.
- **Data Interoperability:** The ability of different data systems and software to work together seamlessly.

- Data Lifecycle Management: The process of managing data from its creation to its eventual disposal, ensuring it remains useful and secure throughout its life.
- Data Noise: Irrelevant or redundant data that can obscure important insights.
- **Data Overload:** The overwhelming amount of data that makes it difficult to extract useful insights.
- **Data Privacy:** The protection of personal and sensitive information from unauthorized access.
- **Data Quality:** The accuracy, completeness, and reliability of data, which affects its usefulness for decision-making.
- **Data Readiness:** The preparedness of data for analysis, ensuring it is clean, accessible, and relevant.
- Data Retention: Policies and practices for how long data should be kept and maintained.
- Data Security: Measures taken to protect data from breaches, theft, or loss.
- **Data Signals:** Key indicators or specific data points that provide important information about business performance.
- **Data Sifting:** The process of filtering through large amounts of data to find relevant information.
- **Data Systems:** Comprehensive frameworks or warehouses where all your data is stored and managed.
- Data Usability: The ease with which data can be accessed, understood, and used for decision-making.
- **Data Warehousing:** The storage of large amounts of data in a central repository for analysis and reporting.
- **Decision Lag:** The delay in making decisions due to overwhelming data or inefficient processes.
- **Digitisation:** The conversion of information into a digital format for easier storage, processing, and transmission.
- Ε
 - Enterprise Development Grant (EDG): A grant that supports projects that help businesses grow and transform, including automation and process redesign.
- G
 - **Growth Discovery Workshop:** A workshop designed to map the customer journey and evaluate the costs and time implications of business challenges.
- Η
 - Human-Centric Data Systems: Data systems designed to enhance user engagement, decision-making empowerment, and adaptability.

l

• **Information Management:** The collection, storage, management, and maintenance of data and information in an organization.

- L
 - Living Knowledge Center: A dynamic repository of knowledge that evolves with new data and insights, supported by Al.
- Ν
 - **Natural Language Processing (NLP):** A field of AI that focuses on the interaction between computers and humans through natural language.
 - **Normalization:** The process of organizing data to reduce redundancy and improve data integrity.
- 0
 - **Operational Analytics:** The use of data analysis and business intelligence to improve day-to-day operations.
- **Optimization:** The process of making something as effective or functional as possible.
- Ρ
 - **Predictive Analytics:** The use of data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes based on historical data.
 - **Proactive Data Quality Management:** Regular monitoring and cleansing of data to maintain high quality, using automated tools to ensure accuracy and reliability.
- Q
 - Query: A request for information from a database or API.
- R
 - **Real-Time Data Processing:** The immediate processing and analysis of data as it is generated, allowing for timely decision-making.
 - **Regression Analysis:** A statistical method for examining the relationship between variables.
 - **Reporting:** The process of organizing data into informational summaries to monitor how different areas of a business are performing.
 - **Retrieval-Augmented Generation (RAG):** A data analysis approach that combines traditional data retrieval methods with the generative capabilities of AI.
- S
 - **Scalability:** The ability of a system to handle increased load or expand in capacity as needed.
 - **Signal-Based Analytics:** An approach that focuses on key data signals to reduce complexity and enhance decision-making.
 - **SMEs (Small and Medium Enterprises)**: Businesses with a limited number of employees and revenue, which face unique challenges in data management.
 - **Strategic Agility:** The ability of an organization to quickly adapt to changes and make timely, accurate decisions.
 - **Strategic Goals:** Long-term objectives that guide an organization's direction and decision-making.

- Т
 - Text Mining: The process of deriving high-quality information from text.
 - **Time Series Analysis:** A method of analyzing a series of data points ordered in time to identify trends, cycles, and seasonal variations.
 - **Traditional Systems:** Conventional methods and tools for data management that may be less efficient and flexible compared to modern solutions.
 - **Transformation:** The process of converting data from one format or structure into another.

U

- **Unstructured Data:** Information that does not have a pre-defined data model or is not organized in a pre-defined manner, such as emails, videos, and social media posts.
- User Interface (UI): The space where interactions between humans and machines occur.

V

• **Visualization:** The representation of data in a graphical format to make information easier to understand and interpret.

W

• **Workflow Automation:** The use of technology to automate the flow of tasks, documents, and information across work-related activities.

Χ

• XML (eXtensible Markup Language): A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Y

• **Yield Analysis:** The process of analyzing the efficiency and productivity of a production process.

Ζ

• Zero-Day Vulnerability: A software security flaw that is unknown to the software vendor and has not been patched, making it susceptible to exploitation.