

## **Barreras en la implementación Big Data y BI en PYMES**

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### **RESUMEN**

La competitividad de las PYMES colombianas, que representan el 99.5% del tejido empresarial, depende de su capacidad para adoptar tecnologías de datos. Sin embargo, existe una brecha digital crítica: mientras herramientas como Business Intelligence (BI) y Big Data pueden optimizar procesos y reducir costos logísticos hasta en un 35%, solo el 30% de las PYMES formales alcanza un nivel avanzado de transformación digital, lo que limita su sostenibilidad y contribuye a una alta mortalidad empresarial.

Esta investigación diagnosticó los retos que obstaculizan la implementación de BI y Big Data en este sector. Mediante un enfoque metodológico mixto y utilizando el

marco teórico TOE (Tecnología-Organización-Entorno), se identificaron cuatro barreras principales: 1) Falta de capacidad personal (34.50%), donde el 63.6% de las empresas carece de equipos especializados, creando un ciclo vicioso que impide medir el ROI y justificar la inversión en talento; 2) Falta de infraestructura tecnológica (29.30%); 3) Costos elevados (24.10%), con la mayoría destinando menos del 10% de su presupuesto a estas tecnologías; y 4) Resistencia al cambio organizacional (12.10%), resultado de un "abismo ejecutivo-operacional" donde la visión directiva no se traduce en recursos.

En respuesta, se propone un marco de implementación adaptativo con tres pilares: adopción de soluciones SaaS asequibles con un "catalizador de adopción" (asesoría y capacitación), aplicación de métricas de ROI simplificadas y conexión con un ecosistema de apoyo gubernamental y financiero. Se concluye que superar el estancamiento digital requiere un abordaje integral que combine tecnología accesible, desarrollo de capital humano y apoyo institucional.

**Palabras clave:** Big Data, Business Intelligence, PYMES, Barreras de Adopción, Marco TOE, Colombia, Retorno de la Inversión (ROI)

## ABSTRACT

In the current digital era, the competitiveness of Colombian Small and Medium-sized Enterprises (SMEs), which constitute 99.5% of the national business fabric, critically depends on their ability to adopt data technologies. However, a significant gap exists: while tools like Business Intelligence (BI) and Big Data can optimize processes and reduce logistical costs by up to 35%, only 30% of formal SMEs achieve an advanced level of digital transformation, limiting their sustainability and contributing to a high business mortality rate.

This study aimed to diagnose the multifaceted challenges hindering the implementation of BI and Big Data in this sector. Using a mixed-methods approach and the TOE (Technology-Organization-Environment) theoretical framework, the research identified four main barriers: 1) Lack of personal capacity (34.50%), where 63.6% of companies lack specialized teams, creating a vicious cycle that prevents measuring ROI; 2) Lack of technological infrastructure (29.30%); 3) High costs (24.10%), with most companies allocating less than 10% of their budget to these initiatives; and 4) Organizational resistance to change (12.10%), a consequence of an "executive-operational abyss" where leadership's vision fails to translate into resource allocation.

In response to this diagnosis, an adaptive implementation framework was designed based on three pillars: the adoption of affordable SaaS solutions coupled with an "adoption catalyst" (advisory and training), the application of simplified ROI metrics aligned with SME priorities, and connection with a supportive ecosystem of government and financial resources. The research concludes that these barriers are systemic and self-reinforcing. Overcoming this digital stagnation requires a comprehensive approach combining accessible technology, human capital development, and institutional support.

**KeyWords: Big Data, Business Intelligence, SMEs, Adoption Barriers, TOE Framework, Colombia, Return on Investment (ROI)**

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