BI – Unit 6 (BI Applications) – END-SEM PYQ Answers

MAY-JUNE 2023

Q7a) Explain BI Applications in CRM. [6 marks]

Customer Relationship Management (CRM) is the strategy and set of practices businesses use to manage interactions with current and potential customers throughout the customer lifecycle — from acquisition through retention. Business Intelligence transforms a CRM system from a simple contact database into a powerful analytical engine that drives personalized, data-driven customer engagement.

How BI Enhances CRM

- Customer Segmentation: BI clustering algorithms group customers by purchase behavior, demographics, and preferences. This allows marketing teams to send targeted campaigns to each segment rather than generic mass emails. Example: A telecom company segments customers into 'heavy data users', 'voice-first seniors', and 'budget-conscious students' and designs separate retention plans for each.
- Churn Prediction: BI predictive models (logistic regression, decision trees) score each customer's likelihood of cancelling a subscription. High-churn-risk customers are proactively contacted with special retention offers before they leave. This is far cheaper than acquiring new customers.
- Customer Lifetime Value (CLV) Analysis: BI calculates the predicted total revenue a customer will generate over their entire relationship with the company. Resources are concentrated on high-CLV customers, and the strategy for low-CLV customers is optimized separately.
- Sentiment Analysis: BI NLP tools analyze customer feedback, social media mentions, and support tickets to gauge sentiment. Negative sentiment trends trigger immediate service quality reviews.
- Sales Funnel Analysis: BI dashboards track conversion rates at each stage of the sales pipeline — from lead to prospect to qualified opportunity to closed deal. This exposes bottlenecks where prospects are being lost.
- Next Best Action (NBA): BI recommendation engines analyze a customer's history and context to suggest the most appropriate next offer, service upgrade, or interaction — similar to how Netflix recommends the next show.

Note: *Salesforce CRM + Tableau is a common enterprise stack. SAP CRM is integrated with SAP BusinessObjects BI for analytics.*

Q7b) Explain Roles of Analytical Tools in Business Intelligence. [6 marks]

Analytical tools are the software engines that power the entire BI pipeline — from raw data ingestion through to insight delivery. Without analytical tools, BI would be limited to manual spreadsheet analysis. Here is how they function across the BI value chain:

- Data Collection and Integration: ETL (Extract, Transform, Load) tools like Informatica, Talend, and Microsoft SSIS collect data from heterogeneous sources (databases, APIs, flat files, cloud services) and unify it into a central data warehouse or data lake. Without this, BI cannot function on siloed data.
- Data Storage and Management: Analytical databases and data warehouses (Amazon Redshift, Google BigQuery, Snowflake) are optimized for columnar read-heavy analytical queries — far faster than transactional OLTP databases for aggregation workloads.

- Statistical and Predictive Analysis: Tools like R, Python (pandas, scikit-learn), WEKA, and RapidMiner enable statisticians and data scientists to apply regression, classification, clustering, and time-series forecasting models to business data.
- OLAP Analysis: OLAP servers (Microsoft SSAS, IBM Cognos TM1) pre-aggregate data into multidimensional cubes, enabling business users to perform drill-down, slice-and-dice, and pivot operations in seconds.
- Visualization and Reporting: Visualization tools like Tableau, Power BI, Qlik Sense, and Cognos Analytics transform analytical results into interactive dashboards and reports that non-technical business users can consume and act upon.
- Real-Time Analytics: Streaming analytics tools (Apache Kafka, Apache Flink) process data in motion — enabling real-time dashboards for stock trading, fraud detection, and supply chain monitoring.

Q7c) Define Business Intelligence. List and explain 3 BI tools. [6 marks]

Definition of Business Intelligence

Business Intelligence (BI) is the umbrella term for the technologies, processes, applications, and practices used to collect, integrate, analyze, and present business data so that it can be transformed into actionable information that drives informed, evidence-based business decisions. BI encompasses data warehousing, ETL, OLAP, reporting, dashboards, and predictive analytics.

Tool 1: WEKA (Waikato Environment for Knowledge Analysis)

WEKA is a free, open-source machine learning and data mining platform developed by the University of Waikato, New Zealand. It provides a comprehensive collection of supervised and unsupervised learning algorithms and data pre-processing tools accessible via a graphical user interface — making it ideal for academic research, rapid prototyping, and teaching.

- Key features: Implements classification (J48 decision tree, Naive Bayes, SVM), clustering (K-Means, DBSCAN), association rules (Apriori), and regression algorithms.
- Explorer interface: Load a dataset (CSV/ARFF format), select a learning algorithm, configure parameters, run the model, and view evaluation results (confusion matrix, ROC curve) — all without writing code.
- Use case: A researcher analyzing customer purchasing patterns loads a transaction dataset into WEKA, runs the Apriori algorithm, and discovers frequent itemsets for a market basket analysis study.
- Limitation: Not designed for production deployment or real-time analytics. Best for experimentation and prototyping.

Tool 2: KNIME (Konstanz Information Miner)

KNIME is a free, open-source visual data analytics platform that uses a node-and-connection workflow paradigm. Analysts build data pipelines by dragging and dropping nodes (each node is a specific operation — read CSV, filter rows, train a model, visualize results) onto a canvas and connecting them in sequence. This visual programming approach makes complex data workflows accessible without deep programming expertise.

- Key features: Data blending from 200+ sources (databases, APIs, cloud storage), built-in ML nodes (linear regression, random forest, neural networks), visual workflow design, Python and R integration for custom code nodes.

- Use case: A retail company builds a KNIME workflow that reads daily sales data from an SQL database, joins it with weather data from an API, trains a demand forecasting model, and exports predictions to a dashboard — all as a scheduled automated pipeline.
- Community Hub: KNIME Hub offers thousands of pre-built, shareable workflows contributed by the community.

Tool 3: RapidMiner

RapidMiner is a commercial (with free Community edition) data science platform that combines visual workflow design (similar to KNIME) with an extensive library of pre-built analytical operators for the full data science lifecycle.

- Key features: 1,500+ machine learning, deep learning, and text mining operators; AutoML capabilities that automatically search for the best algorithm and hyperparameter configuration; drag-and-drop model deployment to REST APIs; built-in explainability reports.
- Use case: A bank's data science team uses RapidMiner to build a credit scoring model. AutoML tests dozens of algorithms, identifies gradient boosting as the best performer, and generates an explainability report showing which features drove each prediction — satisfying regulatory requirements for transparent AI.
- Advantage over WEKA: Enterprise-grade features including team collaboration, model versioning, and one-click deployment — not just a research tool.

Q8a) Explain BI Applications in Telecommunications and Banking. [6 marks]

BI in Telecommunications

The telecom industry generates massive volumes of call detail records, network logs, and customer interaction data every second. BI enables telecoms to monetize this data and maintain competitive advantage.

- Network Performance Monitoring: Real-time BI dashboards track call drop rates, data speeds, and network congestion across geographic regions. Predictive analytics forecast where infrastructure upgrades are needed before quality degrades.
- Churn Analysis and Retention: Predictive models identify subscribers likely to switch to a competitor (churn) based on usage patterns, complaint history, and contract expiration dates. Proactive offers are made to at-risk subscribers.
- Revenue Assurance: BI detects billing anomalies and fraud — e.g., SIM cloning (abnormal call volume from a single SIM), toll fraud, or misconfigured tariff plans causing revenue leakage.
- Product Portfolio Optimization: Analysis of which service bundles (data + voice + OTT) drive the highest ARPU (Average Revenue Per User) guides product design and pricing strategy.

BI in Banking

- Risk Management and Credit Scoring: BI models analyze applicant credit history, income, debt-to-income ratio, and behavioral signals to score loan applications. This reduces NPAs (Non-Performing Assets) while improving approval speed.
- Fraud Detection: Real-time analytics flag unusual transaction patterns — a debit card used in two countries within 30 minutes, or an unusual spike in transaction volume — triggering immediate alerts.
- Customer Lifetime Value Analysis: Banks segment customers by profitability and design relationship programs accordingly — offering premium services (wealth management, priority banking) to high-value customers.

- Regulatory Reporting and Compliance: BI automates the generation of Basel III compliance reports, RBI reporting, and anti-money laundering (AML) transaction monitoring reports with full audit trails.
- Branch Performance Analytics: BI dashboards compare key metrics (customer acquisition rate, loan disbursement volume, customer satisfaction scores) across branches to identify best practices and underperformers.

Q8b) Explain BI Applications in Logistics and Production. [6 marks]

BI in Logistics

Logistics involves the management of the flow of goods, information, and resources between origin and destination. BI brings data-driven optimization to every node of the supply chain.

- Route Optimization: BI integrates GPS tracking, traffic data, and delivery schedules to optimize delivery routes, reducing fuel costs and delivery time. Machine learning models predict the optimal route even under variable traffic conditions.
- Inventory Tracking: Real-time BI dashboards track inventory levels across warehouses and transit. Automated alerts trigger replenishment orders when stock falls below reorder points, preventing both stockouts and overstocking.
- Demand Forecasting: Time-series forecasting models (ARIMA, Prophet) use historical delivery volumes, seasonal patterns, and market signals to predict future demand, enabling pre-positioning of inventory in regional warehouses.
- Carrier Performance Management: BI scorecards track on-time delivery rates, damage rates, and cost-per-shipment for each logistics partner, enabling data-driven carrier selection and contract negotiations.
- Last-Mile Analytics: Analysis of delivery success rates by area, time-of-day, and customer type helps optimize the most expensive part of the logistics chain.

BI in Production / Manufacturing

- OEE (Overall Equipment Effectiveness) Monitoring: BI tracks the three OEE components — Availability (is the machine running?), Performance (is it running at rated speed?), and Quality (is it producing good output?) — in real time across the shop floor.
- Predictive Maintenance: Machine learning models trained on sensor data (vibration, temperature, current draw) predict component failures before they cause downtime, scheduling maintenance proactively rather than reactively.
- Quality Control: Statistical Process Control (SPC) charts in BI dashboards monitor production parameters in real time and signal when a process is drifting out of control limits, enabling correction before defective products are manufactured.
- Production Planning and Scheduling: BI optimizes production schedules by integrating demand forecasts, raw material availability, machine capacity, and workforce schedules to minimize idle time and maximize throughput.

Q8c) Explain the Role of BI in Finance and Marketing. [6 marks]

BI in Finance

- Financial Reporting and Consolidation: BI automates the generation of P&L statements, balance sheets, and cash flow statements, consolidating data from multiple subsidiaries and business units. Closing time is reduced from weeks to days.

- Budgeting and Variance Analysis: BI compares actual spending against budgets in real time, highlighting variances by department, cost center, and account. Finance managers can identify overspending before it becomes a problem.
- Cash Flow Forecasting: Predictive models forecast upcoming cash requirements based on accounts receivable aging, payables schedules, and revenue pipelines, helping treasury manage liquidity.
- Investment Portfolio Analysis: BI tools analyze portfolio performance, risk exposure, and diversification across asset classes, generating risk-adjusted return reports for investment committees.
- Fraud and Audit Trail Management: BI maintains immutable audit logs of all financial transactions and can apply anomaly detection to flag unusual journal entries or approval bypass attempts.

BI in Marketing

- Campaign Performance Analytics: BI measures the ROI of every marketing campaign (email, social, paid search, display) by tracking impressions, clicks, conversions, and revenue attributed to each channel. Budget is shifted toward the best-performing channels.
- Customer Acquisition Cost (CAC) and CLV Analysis: BI calculates CAC by channel and compares it with CLV. Channels where CLV/CAC ratio is high are scaled; unprofitable channels are optimized or cut.
- Marketing Mix Modelling: Statistical models decompose revenue into contributions from each marketing activity (TV ads, digital ads, promotions, seasonality) to determine the optimal marketing budget allocation.
- Personalization and Recommendation Engines: BI-powered recommendation systems (collaborative filtering, content-based filtering) deliver personalized product recommendations, increasing average order value and conversion rates.
- A/B Testing Analytics: BI platforms manage and analyze A/B tests — comparing two versions of a webpage, email subject line, or ad creative — with statistical significance testing to make evidence-based design decisions.

NOV-DEC 2023

Q7a) State and explain different Tools for Business Intelligence. [6 marks]

The BI tools landscape spans several categories depending on the task in the analytics pipeline. Key tools include WEKA, KNIME, and RapidMiner (explained in detail under May-June 2023, Q7c above). Additional tools worth knowing:

- Tableau: A leading data visualization tool known for its intuitive drag-and-drop interface. Users connect to virtually any data source, build interactive dashboards, and share them through Tableau Server or Tableau Public. Extremely strong for geographic analysis and storytelling with data.
- Microsoft Power BI: Integrated with the Microsoft 365 ecosystem, Power BI offers self-service BI to business users. Data is modeled in Power Query, calculations are written in DAX (Data Analysis Expressions), and reports are shared through Power BI Service. Strong choice for organizations already using Azure or Office 365.
- IBM Cognos Analytics: An enterprise BI platform with AI-assisted report building. Cognos is strong for paginated, pixel-perfect financial and operational reports that must conform to a precise layout — unlike Tableau's more exploratory style.

- R (Programming Language): A free, open-source statistical computing language with thousands of packages for data manipulation (dplyr, tidyr), visualization (ggplot2), and machine learning (caret, randomForest). The standard tool in academic research and statistical consulting.
- Apache Spark with MLlib: A distributed processing framework for big data analytics, enabling BI workloads on datasets that are too large for a single machine. Used in conjunction with Hadoop ecosystems in enterprise data lakes.

Q7b) Similarities and Differences between ERP and Business Intelligence. [6 marks]

What is ERP?

Enterprise Resource Planning (ERP) is an integrated software system that manages and automates an organization's core business processes — finance, procurement, manufacturing, supply chain, HR, and sales — in a single unified platform. Examples: SAP S/4HANA, Oracle ERP Cloud, Microsoft Dynamics 365. ERP is OLTP-focused — it handles day-to-day transactional operations.

Similarities

- Both ERP and BI deal with organizational data and are aimed at improving business performance.
- Both require robust data infrastructure and involve large-scale integration across business functions.
- Modern ERP systems (SAP, Oracle) embed native BI analytics modules, blurring the boundary.
- Both support management reporting needs — though at different levels of analytical depth.

Differences

Aspect	ERP	Business Intelligence
Primary purpose	Automate operational processes	Analyze data and support decisions
Data type	Current, transactional (OLTP)	Historical, aggregated (OLAP)
Users	Operational staff (accountants, warehouse workers)	Analysts, managers, executives
Query type	Simple lookups, inserts, updates	Complex aggregations, trend analysis
Time horizon	Real-time current state	Historical patterns and forecasts
Data scope	Single system's operational data	Integrates data from ERP, CRM, SCM, and external sources
Output	Transaction records, operational reports	Dashboards, analytical reports, predictive models

Note: *BI often feeds from ERP: the ERP generates transactional data which is extracted, transformed, and loaded into a data warehouse, from which BI tools generate analytical insights.*

Q7c) [REPEATED] BI Applications in CRM. [5 marks]

Q8a) Role of Data Analytics in Business with Example. [6 marks]

Data analytics is the practice of examining raw data to draw conclusions, identify patterns, and generate actionable insights. In the business context, analytics operates at four progressive levels of sophistication:

- Descriptive Analytics (What happened?): Summarizes historical data. Example: Monthly sales dashboard showing revenue by product category, region, and time period. Used by operations teams to monitor business health.
- Diagnostic Analytics (Why did it happen?): Drills into descriptive data to find root causes. Example: Revenue dropped 15% in Q3 — diagnostic analytics reveals the cause was a 30% decline in one product category due to a competitor's price cut. Uses correlation analysis, drill-down, and data mining.
- Predictive Analytics (What will happen?): Uses statistical models and machine learning to forecast future outcomes. Example: A bank predicts which loan applicants are likely to default in the next 6 months, enabling proactive risk management.
- Prescriptive Analytics (What should we do?): Goes beyond prediction to recommend optimal actions, often using optimization algorithms and simulation. Example: An airline's revenue management system prescribes exactly which seats to price at which fares on each flight to maximize total revenue.

Example — Retail: Amazon's business is fundamentally analytics-driven. Descriptive analytics tracks every customer's purchase history. Predictive analytics powers 'Customers who bought X also bought Y' recommendations (estimated to drive 35% of revenue). Prescriptive analytics dynamically sets prices millions of times per day based on demand, competitor pricing, and inventory levels.

Q8b) How to Implement BI Findings within an Organization? [6 marks]

Discovering insights through BI is only half the challenge — the harder part is driving organizational change based on those insights. Effective BI implementation follows a structured approach:

- Executive Sponsorship: BI initiatives require C-suite champions who mandate data-driven decision-making and create accountability for acting on insights. Without top-down support, teams continue using gut instinct regardless of what the data shows.
- Data Governance and Quality: Establish clear ownership of data (who is accountable for accuracy?), standardized definitions (what exactly does 'active customer' mean?), and data quality processes. Insights built on poor data will be distrusted and ignored.
- Self-Service BI Adoption: Train business users to create their own reports and drill into dashboards rather than waiting for IT to generate custom reports. This democratizes data access and accelerates insight-to-action cycles.
- Embed BI into Workflows: Insights must be surfaced at the point of decision — not in a separate analytics portal that users must proactively visit. E.g., show a salesperson their customer's churn risk score directly in the CRM interface during a call.
- Change Management and Culture: The most important enabler. Organizations must build a data-driven culture where decisions are expected to be justified with data. This requires hiring analytically-minded leaders, rewarding evidence-based decisions, and running internal data literacy programs.
- Measure BI Impact: Track the business outcomes that BI is supposed to improve (churn rate, NPA ratio, inventory turnover) to demonstrate ROI and maintain organizational commitment to the BI program.

Q8c) [REPEATED] BI Applications in Logistics. [5 marks]

MAY-JUNE 2024

Q7a) Advantages / Benefits of Business Intelligence in ERP. [5 marks]

When BI capabilities are integrated with or layered on top of an ERP system, the combined system delivers significantly greater value than either component alone.

- Holistic Business View: ERP contains data from every business function. BI can create cross-functional reports (e.g., how procurement costs affect gross margin — combining Purchasing and Finance ERP modules) that no single ERP module can produce alone.
- Faster and Better Decisions: ERP stores data operationally; BI converts it to strategic intelligence. A manufacturing director can see a real-time OEE dashboard sourced from ERP production orders, making immediate decisions about shift allocation.
- KPI Monitoring and Alerting: BI dashboards on top of ERP data provide real-time alerts when operational KPIs (inventory days, order-to-cash cycle time, defect rate) breach thresholds, enabling fast corrective action.
- Historical Trend Analysis: ERP typically shows current state; BI adds the historical dimension. A 5-year trend of procurement costs by supplier helps negotiate better contracts.
- Reduced Dependency on IT: With self-service BI connected to ERP data, business users generate their own analytical reports without filing IT requests for custom queries — reducing turnaround from days to minutes.
- Compliance Reporting: BI automates the generation of statutory and regulatory reports (GST returns, ESI/PF reports from HR modules) with full audit trails sourced from ERP transaction data.

Q7b) [REPEATED] Role of Analytics in Business Intelligence. [6 marks]

Q7c) Short note on WEKA and RapidMiner. [6 marks]

WEKA

WEKA (Waikato Environment for Knowledge Analysis) is a free, open-source machine learning workbench developed at the University of Waikato, New Zealand, written in Java. It is one of the most widely used academic and research BI/ML platforms due to its comprehensive algorithm library and zero-code graphical interface.

- Interface modes: Explorer (single dataset, interactive), Experimenter (automated comparison of multiple algorithms on multiple datasets), KnowledgeFlow (visual workflow pipeline similar to KNIME), and Command Line for scripting.
- Algorithm coverage: Classification (decision trees via J48/C4.5, Naive Bayes, SVM, k-NN, Logistic Regression), Clustering (K-Means, EM, DBSCAN), Association Rules (Apriori, FP-Growth), Regression (Linear, M5P decision tree regression).
- Data format: Native ARFF (Attribute-Relation File Format) but also reads CSV. Includes built-in filters for missing value imputation, normalization, discretization, and feature selection.
- Best use case: Academic research, teaching ML concepts, rapid prototyping of classification/clustering models on small-to-medium datasets.
- Limitation: Not designed for big data or production deployment. Single-threaded Java processing becomes slow on large datasets.

RapidMiner

RapidMiner is a commercial data science platform (with a free Community edition limited to 10,000 rows and 1 logical processor) that combines visual workflow design, a vast operator library, and enterprise MLOps capabilities. It is positioned as an end-to-end platform from data ingestion through model deployment.

- Visual workflow paradigm: Users drag-and-drop 'operators' onto the Process canvas and connect them in sequence. Each operator has configurable parameters. The workflow is easily version-controlled and shared.
- AutoML (Auto Model): RapidMiner's Auto Model feature automatically tests multiple algorithms (Random Forest, Gradient Boosting, Neural Network, Logistic Regression), performs hyperparameter optimization, and presents a comparison report — reducing model selection from days to minutes.
- Model explainability: Built-in explainability reports show feature importance, partial dependency plots, and SHAP values — satisfying regulatory requirements for transparent AI models in banking and insurance.
- Deployment: Models can be deployed as REST API endpoints directly from RapidMiner without any coding, making operationalization accessible to non-programmers.
- Best use case: Enterprise data science teams that need to rapidly build, compare, deploy, and maintain multiple predictive models with minimal coding, especially in regulated industries.

Q8a) [REPEATED] BI Applications in Logistics and Production. [5 marks]

Q8b) Justify: BI is useful for Customer Relationship Management (CRM). [6 marks]

BI is not merely useful for CRM — it is transformative. Without BI, a CRM system is essentially a digital rolodex: it stores customer contacts and interaction history but cannot answer the questions that actually drive revenue growth and customer retention.

- Justification 1 — From Reactive to Proactive Customer Management: Without BI, companies only know a customer has churned after they've left. With BI predictive models, churn is predicted weeks in advance with 70–85% accuracy, giving the company time to intervene with a targeted retention offer.
- Justification 2 — Personalization at Scale: BI-powered recommendation engines analyze millions of customer interactions to deliver individually personalized product suggestions and communications. Amazon attributes 35% of its revenue to its BI-driven recommendation engine embedded in CRM.
- Justification 3 — Optimizing Sales Effort: BI lead scoring ranks sales leads by likelihood to convert based on company size, industry, engagement behavior (email opens, website visits), and historical win patterns. Sales teams focus 80% of their effort on the top 20% of leads — dramatically improving sales productivity.
- Justification 4 — Measuring Campaign Effectiveness: BI attributing every sale to the specific marketing touchpoints and campaigns that influenced it allows precise measurement of CRM campaign ROI. Without this, marketing budgets are allocated based on intuition.
- Justification 5 — 360-Degree Customer View: BI integrates CRM data with purchase history, support tickets, social media sentiment, and website behavior to create a comprehensive customer profile. This multi-source view enables relationship managers to have fully informed, contextually relevant customer conversations.

Q8c) Short note on KNIME and BI in HR Management. [6 marks]

KNIME

KNIME (Konstanz Information Miner) is a free, open-source data analytics platform built around a visual, node-based workflow paradigm. It is one of the most actively developed open-source BI platforms, with a large commercial ecosystem (KNIME Hub, KNIME Server for team collaboration and automation) built around the free core product.

- Workflow model: Each analysis step is represented as a 'node' — e.g., 'CSV Reader', 'Row Filter', 'Decision Tree Learner', 'ROC Curve' plotter. Nodes are connected by arrows representing data flow. The visual metaphor makes complex pipelines auditable and self-documenting.
- Extensibility: KNIME's Extension Centre provides 2000+ community nodes for specific use cases — Cheminformatics, Bioinformatics, Deep Learning (via PyTorch and TensorFlow integration nodes), and more. Python and R code can be embedded as custom script nodes when built-in nodes are insufficient.
- Integration: KNIME connects natively to SQL databases, REST APIs, Hadoop, Spark, Salesforce, and cloud storage (S3, Azure Blob, GCS).
- Typical workflow example: Read sales CSV → Join with customer database → Filter to last 12 months → Run K-Means clustering → Visualize clusters on scatter plot → Write cluster assignments back to SQL database for CRM targeting.

BI in HR Management

Human Resource Management generates rich data across the employee lifecycle — recruitment, onboarding, performance, compensation, training, and attrition. BI transforms this data into People Analytics, enabling HR to shift from administrative function to strategic business partner.

- Attrition Prediction (People Retention): BI models predict which employees are at high risk of leaving, using features like time since last promotion, compensation relative to market, manager satisfaction scores, and peer network strength. HR proactively intervenes with career development conversations or compensation reviews.
- Recruitment Analytics: BI tracks the effectiveness of different hiring sources (LinkedIn, referrals, job portals) by measuring hire quality (90-day retention, performance ratings) and cost-per-hire. Budget shifts to the most effective sourcing channels.
- Workforce Planning: BI forecasts future headcount requirements by business unit and skill set, based on revenue projections and historical productivity ratios. This allows HR to initiate hiring or reskilling programs 6–12 months before the need becomes critical.
- Compensation Benchmarking: BI analyzes internal pay equity (ensuring equal pay for equal work across genders, demographics, and departments) and benchmarks compensation against external market surveys.
- Learning and Development ROI: BI measures whether training programs actually improve employee performance, promotion rates, and retention — enabling HR to invest in the training modalities that deliver real business outcomes.

Note: *Tools like Workday Prism Analytics and SAP SuccessFactors embed BI natively into the HR platform. Standalone People Analytics tools include Visier and OrgVue.*

Additional Concepts & Quick Reference

BI Tools Comparison Summary

Tool	Type	Key Strength	Best For	Cost
WEKA	ML workbench	Wide algorithm library, GUI	Research, teaching, prototyping	Free (open-source)
KNIME	Visual analytics platform	Node workflow, 2000+ extensions	End-to-end pipelines, no-code analytics	Free (+ KNIME Server commercial)
RapidMiner	Data science platform	AutoML, one-click deployment	Enterprise ML production pipelines	Community free, enterprise paid
R	Statistical language	Best-in-class statistics packages	Advanced statistical modeling, academia	Free (open-source)
Tableau	Data visualization	Best-in-class interactive visuals	Business dashboards, data storytelling	Commercial
Power BI	Self-service BI	Office 365 integration, DAX	Microsoft ecosystem organizations	Freemium

BI Application Domains — Quick Summary

Domain	Primary BI Use Cases
CRM	Churn prediction, CLV analysis, sentiment analysis, sales funnel, lead scoring, personalization
ERP	Cross-module KPI dashboards, variance analysis, compliance reporting, historical trend analysis
Logistics	Route optimization, demand forecasting, inventory tracking, carrier performance, last-mile analytics
Production	OEE monitoring, predictive maintenance, quality control (SPC), production scheduling
Finance	P&L consolidation, cash flow forecasting, fraud detection, portfolio analysis, budgeting
Marketing	Campaign ROI, CAC vs CLV, marketing mix modelling, A/B testing, recommendation engines
HR	Attrition prediction, recruitment analytics, workforce planning, pay equity, L&D ROI
Banking	Credit scoring, fraud detection, regulatory reporting, branch performance, AML monitoring

Domain	Primary BI Use Cases
Telecom	Churn analysis, network monitoring, revenue assurance, product portfolio optimization

Four Types of Analytics — Maturity Model

Type	Question Answered	Technique	Value	Difficulty
Descriptive	What happened?	Reporting, dashboards, aggregation	Moderate	Low
Diagnostic	Why did it happen?	Drill-down, correlation, root cause analysis	High	Medium
Predictive	What will happen?	ML models, regression, forecasting	Very High	High
Prescriptive	What should we do?	Optimization, simulation, reinforcement learning	Highest	Highest

NOV-DEC 2025 [REPEATED] All questions repeated.

MAY-JUN 2025 [REPEATED] All questions repeated.

Cross-Reference: All Unit 6 Questions Across All 5 Years

Topic	MJ-23	ND-23	MJ-24	ND-25	MJ-25
BI in CRM	Q7a	Q7c	Q8b*	Q7b & Q8a	Q8a
BI Tools (WEKA, KNIME, RapidMiner)	Q7c	Q7a	Q7c*	Q7a	-
BI in ERP (advantages/role)	-	Q7b	Q7a	Q7c	Q8c
Analytical Tools Role in BI	Q7b	-	Q7b*	-	Q8b
BI in Finance and Marketing	Q8c	-	-	Q8b	Q7c
BI in Telecom and Banking	Q8a	-	-	-	Q7a
BI in Logistics and Production	Q8b	Q8c*	-	-	Q7b
Data Analytics Role in Business	-	Q8a	Q8a*	Q8c	-
Implement BI findings in org	-	Q8b	-	-	-
WEKA + RapidMiner (dedicated)	-	-	Q7c	-	-
KNIME + BI in HR	-	-	Q8c	-	-

BI in CRM is the most repeatedly tested topic in Unit 6, appearing in every single examination session and often appearing twice in the same paper (as both Q7 and Q8 ask CRM-related questions). BI Tools is the second most frequent. Any student who deeply understands BI in CRM and the three major analytical tools (WEKA, KNIME, RapidMiner) will be well-positioned for the Unit 6 section.