# BUSINESS INTELLIGENCE ENGINEER

# ROLE GUIDELINE



**Guideline Last Updated**: August, 2020

**Contains Expectations for:** Individual Contributors

**Guideline Notes:** Questions email [bie-level-clarification@amazon.com](mailto:de-level-clarification@amazon.com)

**Amazon Business Intelligence Engineer (BIE) Role Guideline**

This guideline contains the general expectations of the BIE role. It describes the most common responsibilities, however given the wide variety of businesses and technologies at Amazon, it cannot capture all expectations. No two Amazon teams are alike and each is encouraged to develop their own approach to delighting their customers. This alters the way a BIE is expected to operate and what constitutes success. Each section has a specific purpose.

* **Section 1: “BIE Level Matrix”** is a high-level view of how BIE functional abilities map to each level. Ideal for quick comparisons of level vs. role expectations for use in hiring and promotion discussions.
* **Sections 2-5:** “**What you do**” contains more details about BIE job level expectations to guide team hiring strategies and performance discussions. Contains a graphic to illustrate the scope and impact for the level.
* **Sections 2-5 “Moving to…”** bullets isolate key skills at the next level that should be demonstrated to be considered for promotion. This is not a promotion checklist. Every promotion case is unique; the results you deliver (*and how they are delivered)* also play a role in promotion evaluations.

This guideline does not repeat expectations documented in previous levels (i.e., the abilities of higher levels inherit those of lower levels). This means a Principal BIE has all of the abilities described in Levels 4-6.

1. **BIE Level Matrix**

The purpose of the BIE Level Matrix is to provide a quick view of how functional areas change by level. The Level Matrix does not include Amazon Leadership Principles, as they do not change by level or by role. For hiring, coaching, and promotion discussions, see **Sections 2-5**.

**1.1 BIE Functional Dimensions**

* **Ambiguity**: Degree that business problems and data needs are defined. Also clarifies how much supervision is required vs. when an BIE can deliver independently.
* **Scope** **and Influence**: The type of work typically handled by each BIE level (**components**, **architecture**, etc.). Clarifies BIE levels that influence within a **team** versus (vs.) an **organization**.
* **Execution**: Concise view of BIE expectations, including which levels are **tactical** and **strategic**. Ability to build consensus on data design, metrics, and analysis to drive business and system strategy. Includes a type of trade-off they may make.
* **Impact**: BIE impact on business decisions, real world applications, new opportunities, and technologies.
* **Technical**: BIE skills by level. The degree of difficulty/complexity in the effort or BI **architecture** that a BIE level can reasonably handle.
* **Process Improvement**: Automates and improves data pipelines, analytical and reporting processes. Focus is on BI solution resilience, maintainability, operational excellence and data quality.
* **Experience:** Suggested experience to meet level expectations. Education is not required if the candidate has equivalent knowledge gained from experience.

**1.2 BIE Level Matrix**

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| --- | --- | --- | --- | --- |
| **Dimension** | **L4: BIE I** | **L5: BIE II** | **L6: BIE III** | **L7: Principal BIE** |
| **Ambiguity** | Problem is well defined or structured. Will occasionally need guidance. | Problem is loosely defined or structured. Delivers independently, but will seek direction. | Problem is not well defined or structured. Delivers independently, with limited guidance. | BI strategy is not defined. May not even know what the problem is before starting. Delivers with complete independence. |
| **Scope and Influence** | Typically works on small BI solutions or components of larger solutions. Influences own team. | Typically works on large BI solutions. Influences other teams. | Typically works on large BI solutions and defining the team's BI strategy. Influences the organization's BI architecture. | Typically works on the organization's BI architecture. Influence may span multiple organizations. |
| **Execution** | Provides BI solutions for **straightforward[[1]](#footnote-1)** problems. Work is **tactical[[2]](#footnote-2)**. Builds and maintains basic data artifacts (e.g., ETL, data models, queries) and reports that correctly answer business questions. Utilizes analytics and metrics visualization tools. Able to investigate data anomalies. Communicates effectively (e.g., proposals, findings, wikis) with a technical audience. Helps train new peers. | Provides BI solutions for **difficult[[3]](#footnote-3)** problems. Solutions are efficient, testable, maintainable, and resistant to data quality issues. Work is tactical; learning to be **strategic[[4]](#footnote-4)**. Communicates effectively with both technical and non-technical audiences (e.g., emails, design documents, analysis, etc.). Makes short-term implementation trade-offs. Can balance customer requirements with technology requirements. Begins to mentor. | Provides BI solutions for **complex[[5]](#footnote-5)** problems. Work is tactical and strategic. Solutions are robust, extensible and scalable. Communicates effectively with management audiences (e.g., narratives, inputs into MBRs/QBRs). Refines data strategies that cross teams. Drives business understanding. Makes technical trade-offs for long term/short-term needs. Mentors and develops others. Performs BIE tech assessments. | Provides BI solutions for **significantly complex[[6]](#footnote-6)** problems. Solutions are exemplary in terms of long-term application, stability, and cost-efficiency. Work is strategic. Uses knowledge to define the organization’s analytics approach. Drives excellence in data and analysis techniques. Makes and quantifies organization trade-offs and implements mechanisms to ensure that benefit persists. Actively mentors develops others. Performs Principal BIE tech assessments. |
| **Technical** | Proficient in SQL. Knows how to ingest process, persist, and analyze data. Basic understanding of distributed systems, data modelling, and scientific methods. Proficient in descriptive statistics and familiar with inferential statistics. | Basic understanding of a scripting language. Knows how to model data and design a data pipeline. Able to apply basic statistical methods (e.g. regression) for difficult business problems. | Knows how to design and implement technical solutions with an appropriate analytics strategy and data set design. Understands system limitations, scaling factors, boundary conditions, and/or the reasons for technical decisions. | Artifacts set the standard in their organization for excellence, from designs to implementations to technical documents. |
| **Impact** | Provides solutions that inform team's business decisions | Provides solutions that drive team's business decisions and highlight new opportunities. | Provides solutions that inform multiple team's business decisions. Clarifies business questions for multiple teams. | Provides solutions that inform business decisions across the organization. Helps the organization to not just answer business questions, but to ask the right ones. |
| **Process Improvement** | Improves dataset quality and automates manual processes. | Improves code quality and optimizes BI processes (speed, cost, reliability, etc.). Enablese self-service access to underlying data as appropriate. May establish data and reporting SLAs. | Drives best practices in operational excellence, data modelling, and analysis. Assures BI solutions are correctly and efficiently supporting the business. | Sets the standard in business intelligence for the organization. Establishes best practices. Aligns teams and orgs toward simple, coherent approaches. |
| **Suggested Experience** | No experience required, provided the BIE I tech bar is met. | 2+ years experience | 5+ years experience | 10+ years experience |

**2. BIE I**

**2.1 Scope and Impact**

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**2.2 What you do…**

You build small to mid-size BI solutions—data sets, queries, reports, dashboards, analyses—or components of larger solutions to answer straightforward business questions with data. Your work incorporates business intelligence best practices, data management fundamentals, and analysis principles. You are able to take well-defined requirements, build a solution, and deliver it on schedule. You seek input and guidance from team members on both the technology and the business. You have a good understanding of the relevant data lineage: including sources of data; how metrics are aggregated; and how the resulting business intelligence is consumed, interpreted and acted upon by the business. Your end product enables effective, data-driven business decisions.

You are knowledgeable in a variety of strategies for querying, processing, persisting, analyzing and presenting data. You are proficient in SQL. You  know how to maintain and refine straightforward ETL. You create and populate data structures using one or more schema definition languages (e.g. DDL, SDL, XSD, RDF). You write secure, stable, testable, maintainable code with minimal defects. You automate manual processes where possible. You use one or more industry analytics visualization tools (e.g. Excel, Tableau/QuickSight/MicroStrategy/PowerBI) and, as needed, statistical methods (e.g. t-test, Chi-squared) to deliver actionable insights to stakeholders.

You are a passionate advocate for your customer. In addition to metrics definitions, you learn the business context and technologies behind your team’s data infrastructure. You work effectively with customers (e.g., business teams, Data Scientists, etc.) and other internal partners to ensure deliverables are aligned with expectations. You invent, refine and develop your BI solutions to ensure they are meeting the needs of the business and team goals.

You assume responsibility for the code, queries, reports and analyses you inherit or produce. You get your analyses and code reviewed. You test your code by validating outputs against source data, business logic, and related metrics. You classify, store, and handle data in accordance with Amazon policies. You clearly document your solutions to ensure ease of use and interpretation, as well as maintainability by others. You partner effectively with peer BIEs and others in your team. You are able to troubleshoot, research root causes, propose solutions, and either take ownership for their resolution or ensure a clear hand-off to the right owner. You participate in team design, scoping, and prioritization discussions.

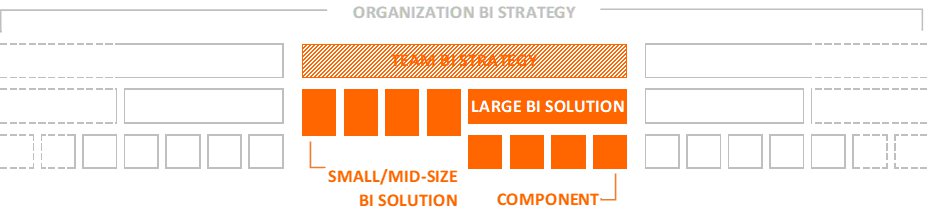
**2.3 Moving to BIE II…**

You will be considered for promotion to BIE II if you consistently demonstrate a combination of the following:

* You design, implement, and deploy BI solutions. You successfully solve difficult and/or loosely structured problems. You are able to refine requirements from business stakeholders into a functional design that solves the problem.
* You have a solid understanding of data design approaches and analysis techniques (and how to best use them).
* You are able to work independently and with your team to deliver BI solutions successfully.
* Your work is consistently of a high quality (e.g., maintainable, efficient, well-documented) and incorporates best practices. Your team trusts your work.
* Reviews of your analyses and code tend to be rapid and uneventful. You provide useful review comments for others.
* You focus on operational excellence: constructively identifying quality issues, proposing solutions when necessary, taking on projects that improve your team’s BI solutions, and making them better and easier to maintain.
* You have established good working relationships with teammates and peers. You recognize discordant views and take part in constructive dialogue to resolve them.
* You are able to confidently train new teammates about your team’s BI solutions: how they are constructed, how they operate together, and how they serve your customers.

**3. BIE II**

**3.1 Scope and Impact**

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**3.2 What you do…**

You build mid-size to large BI solutions or components of larger solutions. Your focus is at the team level, working on a major portion of existing or new BI artifacts (e.g., contributing to the team’s datamart) or owning a difficult report or analysis. You solve difficult problems that are loosely defined or structured. You are a significant contributor and can deliver with limited guidance. Your work is consistently of high quality. You have a deep understanding of data lineage of your team’s BI solutions: the technical systems by which the data is generated; how the metrics are aggregated; and how the resulting business intelligence  is consumed, interpreted and acted upon by the business.

You are able to apply a broad range of data design approaches as they relate to analytics. You know when it is appropriate to use them (and when it is not). You do things with the proper level of complexity the first time (or at least minimize incidental complexity). You apply appropriate technologies and follow best practices. You understand the technologies behind your team’s data infrastructure, and you balance customer requirements with these technology constraints. You consider the legacy of the processes you create, limiting the use of short-term workarounds. Your solutions are testable, maintainable and performant. You are mindful of resource usage (e.g., system hardware, data storage, query optimization, AWS infrastructure etc.), make appropriate trade-offs, re-use where possible, and are judicious about introducing dependencies. You maintain and update—and may even create—scripts (e.g. R, Python, Shell) to simplify BI processes. You choose wisely from a variety of industry analytics and metrics visualization tools. You are able to apply basic statistical methods (e.g. regression) to difficult business problems and understand these methods’ assumptions and limitations. You write clear documentation of your designs.

You collaborate with customers and other internal partners to refine the problem into specific deliverables, and you understand the business context well enough to recommend alternatives and anticipate future requests. In addition to stakeholders, you may work with partner teams (business and technical) and Data Engineers/Data Scientists/BA/SDES/other BIEs to design and deliver the right solution. When the business requires finer detail than established reports provide, you minimize bottlenecks and may choose to advise your customers on self-service access to underlying data. You communicate the findings from your deliverables to your customers in an appropriate manner.

You contribute to your team’s design, scoping, and prioritization decisions. You are able to train new peers about how the team’s BI solutions are constructed, how they operate together, and how they serve the organization. You mentor and help to develop others. You may help recruit and interview for your team.

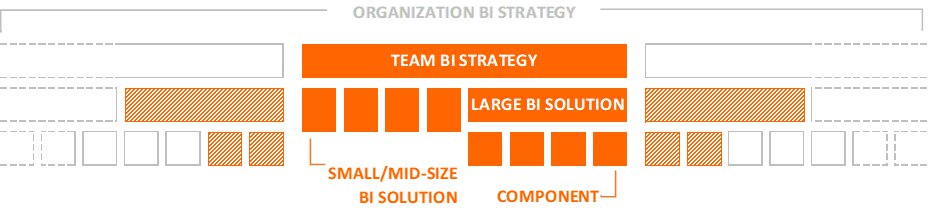
**3.3 Moving to BIE III…**

You will be considered for promotion to BIE III if you consistently demonstrate a combination of the following:

* You lead the design, implementation, and delivery of BI solutions in complex, ambiguous or poorly defined problem spaces. Your efforts may produce new solutions or revise (or even deprecate) existing ones. You play a significant hands-on role in both the design and the delivery of your team’s most critical data artifacts. You make the right trade-offs. The problems you solve are complex, but your solutions are as simple as possible.
* You think in terms of architecture, not just code. You proactively work to improve the consistency and integration between your team’s BI solutions and any related systems or artifacts (owned by other teams). You understand that many problems are not new and explore re-using or extending existing solutions first. You understand that creating new  BI solutions is not always the right action.
* You influence your team’s technical and business strategy by making insightful contributions to team priorities and approach. You take the lead in identifying and solving BI architecture deficiencies that limit the innovation of your team or of other teams. You help your team deliver higher quality solutions faster (or fail faster to get to the right solution).
* You are able to communicate your ideas effectively to achieve the right outcome for your team and customer. You seek diverse perspectives, listen to feedback, and are willing to change direction if it creates a better outcome. You harmonize discordant views and lead the resolution of contentious issues (build consensus).
* You lead design reviews for BI solutions or analyses for your team and actively participate in reviews for related teams in your organization or at your location.
* Your code, design, and implementation decisions set a great example to others and demonstrate best practices. You provide insightful code reviews and take ownership of outcome. (“You ‘ship it’, you own it.”) You work very efficiently and routinely deliver the right things.
* You demonstrate your ability to influence, positively impacting the technical decisions made by other teams (in your organization or at your location). The influence can be via a collaborative software effort or by driving BI engineering best practices (e.g. analytical rigor, code quality, data quality, data modelling, operational excellence, automation, visualization).
* You actively participate in the hiring process as well as mentor others - improving their skills, their knowledge of your BI solutions, and their ability to get things done.

**4. BIE III**

**4.1 Scope and Impact**

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**4.2 What you do…**

You are considered a technical leader on your team. You work efficiently and routinely deliver the right things with limited guidance. Your work focuses on complex and/or ambiguous problem areas in existing or new BI initiatives. You take the long term view of your team's solutions and how they fit into the team’s architecture. You consider where each solution is in its lifecycle and where appropriate, proactively fix architecture deficiencies. You have a deep understanding of—and influence over—data lineage across the organization: including technical systems by which the data is generated; how metrics are aggregated; and how the resulting business intelligence is consumed, interpreted and acted upon by the business.

You use your expertise and knowledge of the business and its technologies to drive insightful discussions with customers and can anticipate—and possibly influence—their future requirements. You understand that not all problems are new (or require new data BI solutions). You ensure your team’s BI solutions are accurate, timely, accessible and actionable. You show good judgment when making trade-offs between your team’s investment (e.g. team prioritization, data retention policy, infrastructure costs) and the business need. You are able to take the lead on large projects that require the work of multiple persons. You know how to divide a BI project into parallel work that can be performed by you and other data professionals and then reassembled successfully into a cohesive launch.

You understand capabilities and limitations of the systems you work with (e.g. cluster size, concurrent users, data classification). You are able to explain these limitations to technical and non-technical audiences, helping them understand what’s currently possible and which efforts need a technology investment (e.g., data pipeline doesn’t exist, report needs additional functionality, etc.). Your code submissions and analytics approach to work are exemplary. Your BI solutions are inventive, robust, scalable, extensible, and easy for others to maintain and build upon. You understand that not all problems are new (or require new BI solutions).

You are a key influencer in team strategy. You take ownership of team infrastructure, providing a system-wide view and design guidance. You make things simpler. You drive BI engineering best practices (e.g. Operational Excellence, code reviews, syntax and naming convention, metric definitions, alarms) and set standards. You work to resolve the root cause(s) of pervasive or persistent problems; your efforts may unblock related teams. This may require you to influence decisions made by other teams. You build consensus; when confronted with discordant views, you are able to find the best path forward and influence others to follow that path. You actively recruit and help others leverage your expertise, by coaching and mentoring in your organization (or at your location). You provide technical assessments for BIE II and BIE III promotions. You contribute to the professional development of colleagues, improving their business and technical knowledge and their understanding of BI engineering best practices. You ensure your team is stronger because of your presence, but does not require your presence to be successful.

**4.3 Moving to Principal BIE…**

You will be considered for promotion to Principal BIE if you consistently demonstrate a combination of the following:

* You take the lead on the design, implementation, and delivery of BI solutions in a highly ambiguous and significantly complex problem space that have a long-term impact on a business, organization, or technology. Your efforts may produce new solutions or refactor, or even deprecate, existing solutions. You heavily influence the design and deliver a significant portion of critical-path code and/or analysis. You make the right trade-offs. Your solutions are as simple as possible. You only advocate for new BI solutions when it is necessary.
* Your artifacts are noteworthy in some way (e.g., changes the way the business operates; offers significant extensibility and scalability, or has some other impact on operational excellence).
* Your methods, artifacts, and the code you personally contribute set the standard in your organization for BI engineering excellence, from designs to data models to analyses. You drive new best practices.
* You identify and tackle intrinsically hard problems. (e.g., highly complex, ambiguous, undefined, with less existing structure, or having significant business risk or potential for significant impact).
* You are a pragmatic problem solver, applying judgment and experience to balance trade-offs between competing interests. You are flexible, adapting your approach to meet the needs of the team, the customers, and the project or product.
* Your personal code submissions and reviews of other people’s code are instructive and make the overall code corpus better.
* You lead and actively participate in design reviews, aligning teams across your organization towards coherent analytics strategies. You bring clarity to complexity, probe assumptions, illuminate pitfalls, and foster shared understanding.
* You participate in the hiring/interview process and may actively recruit for Amazon.
* You play a significant role in the career development of others, actively mentoring and educating the larger BIE community on trends, technologies, and best practices.
* You keep abreast of industry trends. You effectively research and benchmark our solutions against other analytics platforms in the industry.
* You contribute to intellectual property (e.g., invent, submit patents, etc.)

**5. Principal BIE**

**5.1 Scope and Impact**

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**5.2 What you do…**

You are a trusted part of the business and technical leadership of an organization, typically at the Director level. As a key influencer in planning strategy, you bring business and industry context to business and technology decisions. You set the standard for BI engineering excellence in your organization. Your solutions are exemplary in terms of efficiency, stability, extensibility, and the ability to evolve over time. Your coding practices are exemplary in terms of code organization, clarity, simplicity, error handling, and documentation Your solutions are robust in the presence of failures, scalable, and cost-effective. You define the organization’s analytics strategy and ensure it’s aligned with the data architecture and business strategy. You drive proper data governance: data integrity, metrics definitions, single versions of truth, accountability, documentation, adherence to high standards. You simplify the design and improve existing solutions, models, and processes.

As a hands-on technical leader with business intelligence expertise, you split your time between advising senior leaders, delivering BI artifacts, driving data architecture improvements, or wherever where your skills will have the greatest impact (or in response to job requirements). For example, your expertise may be broadly applied across many teams in the strategy (business and/or technical), design, and delivery of a significant portion of BI architecture. Or you may personally produce code for a significant, critical, or demanding initiative and influence just the few teams closest to it. The exact role you play may also change as a larger initiatives progress; during the early phases, you may broadly influence several related teams and then subsequently spend weeks or months focusing on a particularly challenging problem. Sometimes the mix goes the other way and you spend most of your time broadly influencing multiple teams and only occasionally dive deeply into a critical, highly complex area in a particular team.

You tackle intrinsically hard problems, acquiring expertise as needed. You are able to deconstruct complex problems to provide straightforward solutions. You are accountable for significantly large projects, often in new territory, with quantifiable impact. You identify questions we’re not yet asking of the data (but should be) and design new and innovative approaches to answer current and future business questions. You take the lead on projects that may require the work of several *teams*to implement. You understand the work of SDEs, Data Engineers, various scientists, Business Analysts, and others well enough to leverage these roles toward a common objective. You are able to divide responsibilities so that each team can work independently and have the system come together into an integrated whole. You are flexible, adapting your approach to meet the needs of the team, project, or product. You solicit differing views and are willing to change your mind as you learn more. You are adept at building consensus.

You amplify your impact by leading and participating in design reviews for solutions to ambiguous or complex problems. You probe assumptions, illuminate pitfalls, and foster shared understanding. You align teams toward coherent data and/or BI strategies. You educate, keeping the engineering community up to date on advanced technical issues, technologies, and trends. You participate, sharing knowledge and collaborating with other Senior Engineers, specifically attending and/or presenting at internal conferences, Principal Engineer community events and making yourself available to global developer outreach efforts. You help managers to understand the different data roles and make the correct staffing decisions. You also help them guide the career growth of their team members by mentoring, performing Principal promotion assessments, and participating in performance discussions.

**5.3 Moving to Senior Principal - Tech**

For “Moving to…” criteria, refer to the [Sr. Principal – Tech Role Guideline](https://inside.amazon.com/en/Employment/Career/Role_Guidelines/_layouts/WordViewer.aspx?id=/en/Employment/Career/Role_Guidelines/Role_Guidelines/Senior_Principal_Tech_Role_Guideline.docx)..

**BIE ROLE CLARIFICATION FAQ**

**Additional resources**

* [BIE Role Update Wiki](https://w.amazon.com/bin/view/Business_Intelligence_Engineer_Role/)
* [BIE Alignment Tool](https://w.amazon.com/bin/view/Business_Intelligence_Engineer_Role/Managers/#HBIEAlignmentProcess26Tool) (for managers of BIE Individual Contributors)
* BIE Promotions
  + [Promo policies during the rollout](https://w.amazon.com/index.php/Business_Intelligence_Engineer_Role/Managers" \l "HFAQ11:Howdoesthischangeimpactupcomingpromotions3F)
  + [Guidance for Tech Promo Assessors (TPAs)](https://w.amazon.com/bin/view/Business_Intelligence_Engineer_Role/TechAssessors/)
  + [Amazon Assess (to request and receive TPAs)](https://assess.corp.amazon.com/)
  + [Tech Promo Wiki](https://w.amazon.com/bin/view/Tech_Promo/)
* [BIE Bar Raiser Guidance](https://w.amazon.com/bin/view/Business_Intelligence_Engineer_Role/BRs/)
* [Data Roles Comparison](https://inside.amazon.com/en/Employment/Career/Role_Guidelines/Role_Guidelines/Role%20Comparisons/Data_Role_Comparison_Guideline.docx)

1. **Is coding a skill required for BIE?**

Yes. BIEs should be able to read, write, and debug code as described in the tech bar for their level.

1. **What is the Technical Bar for a BIE?**

This is a minimum bar. Organizations may expect a higher bar, not a lower one. When looking at a level, be sure to include all technical expectations, up to and including that level.

**For Bar Raisers and Hiring Managers, BIE technical expectations by level:**

**BIE I:**

* Has quantitative or engineering  background (e.g. Bachelor’s degree in CS, Economics, Biochemistry, Mathematics; or 3 years relevant experience).
* Understands how to use one or more industry analytics and metrics visualization tools (e.g. Excel, Tableau/QuickSight/MicroStrategy/PowerBI).
* Proficiency in SQL.
* Knowledgeable in a variety of methods for querying, processing, persisting, analyzing and presenting data*.*
* Understands one or more schema definition languages (e.g. DDL, SDL, XSD, RDF).
* Has a good understanding of data lineage: including sources of data; how metrics are aggregated; and how the resulting business intelligence is consumed, interpreted and acted upon by the business.
* Proficient in descriptive statistics (i.e. measures of distribution). You are familiar with inferential statistics (e.g. hypothesis testing, confidence intervals) and know when such methods are appropriate.
* Knowledgeable in methods for identifying trends in metrics. Able to segment metrics along suitable dimensions to reveal deeper dynamics.
* Able to dive deeply into technical and operational details of the business (e.g., key dependencies, business drivers/KPIs, develop actionable business insights, etc.) and contribute to a constructive technical discussion.

**BIE II:**

* Advanced knowledge in a variety of industry analytics and metrics visualization tools (e.g., Excel, Tableau/QuickSight/MicroStrategy/PowerBI).
* Understands one or more scripting languages (e.g. Python, R, Shell) in order to update or troubleshoot existing scripts for basic BI use cases (e.g. data transformations, statistical tests and analyses, process automation).
* Able to apply a broad range of data design approaches, as it relates to analytics (e.g., snowflaking). Knows when it is appropriate to use them (and when it is not).
* Understands distributed systems concepts, primarily as it pertains to data storage and compute (e.g. RedShift distribution keys).
* Able to support a basic cloud-based database solution (e.g. Redshift, S3).
* Has a deep understanding of data lineage: the technical systems by which data is generated; how metrics are aggregated; and how the resulting business intelligence  is consumed, interpreted and acted upon by the business.
* Able to apply basic statistical methods (e.g. regression) to difficult business problems and understand these methods’ assumptions and limitations.
* Able to apply techniques that uncover relationships between variables. Understands the difference between correlation and causation.
* Analytical code and BI solutions are high quality and low maintenance. Writes code that a BIE/DE unfamiliar with the logic can understand.
* Able to deliver analytical solutions that are correct, stable, maintainable, and performant.
* Does things with the proper level of complexity the first time (or at least minimizes incidental complexity). Can create flexible analytical solutions without over-engineering.
* Understands how to make appropriate trade-offs. Can balance customer requirements with technology requirements. Knows when to re-use code. Is judicious about introducing dependencies.
* Understands how to be efficient with resource usage (e.g., licenses, data storage, query optimization, AWS infrastructure etc.). Understands how to trade off between speed of delivery, overhead costs, and resource efficiency.
* Knowledge of engineering and operational excellence best practices. Can make enhancements that improve data processes (e.g., data auditing solutions, management of manually maintained tables, automating, ad-hoc or manual operation steps).

**BIE III:**

* Able to take the lead on the technical solution to a complex business problem. They can design the right analytics strategy, define the necessary data set, implement, and deliver. Examples can be a refactor or a new analytics process (e.g., data model, data architecture, data flow design, analysis and self-service tool, as applicable).
* Is able to evaluate end-to-end data designs for strengths and weaknesses (e.g. data quality, scalability, latency, security, performance, data integrity).
* Able to implement and support a basic cloud-based database solution (e.g. Redshift, S3)
* Has knowledge of statistical or graphical methods to calibrate and assess KPIs. Able to set alarms on metrics based on historical variance and calculate confidence intervals and statistical tests.
* Understands which aspects of an effort require a Scientist role (Applied Scientist, Data Scientist, Economist, Research Scientist). To be able to do this, they need to be aware of advanced statistical techniques (e.g., clustering, classification) and their applications to recommend the right role.
* Understands which aspects of an effort require a Data Engineer. To be able to do this, they need to be aware of recent advances in distributed systems (e.g. NoSQL databases).
* BI solutions are easily usable by customers – inventive, secure, maintainable, scalable, and extensible. BI solutions are also easy for others to contribute to. Knows how to make data auditable, available, and accessible for customers.
* Is able to influence team technical and analytical strategy. Understands that not all problems are new (or require new BI solutions). Is able to make appropriate architectural trade-offs (e.g. Build or license a Business Intelligence technology? Tiered storage strategy?).  Shows good judgment when making technical trade-offs between short-term technology needs and long-term business needs.
* Code, designs and implementation decisions set a great example to others. You provide insightful code reviews and take ownership of outcome. (“You ‘ship it’, you own it.”) You work very efficiently and routinely deliver the right things.
* Understands system limitations, scaling factors, boundary conditions, and/or the reasons for architectural decisions *(Q. Why did we build X in this way? What assumptions were made? Do we need to build something else– if so why?).*

**Principal BIE**

* Able to tackle intrinsically hard problems (e.g., highly complex, ambiguous, undefined, with less existing structure, significant business risk, or potential for significant impact), acquiring expertise as needed.
* Decomposes complex problems to provide straight-forward solutions, often inventing new ones.
* Can develop innovative solutions that leverage multiple techniques and/or technologies.
* Hands-on technical leader. Sets the standard for BI engineering excellence in an organization.
* BI solutions are exemplary in terms of efficiency, cost-effectiveness, stability, extensibility, and the ability to evolve over time.
* Coding practices are exemplary in terms of code organization, clarity, simplicity, error handling, and documentation.
* Well-versed on advanced technical issues, data technologies, scientific methodologies and trends.
* Can lead design reviews for complex or ambiguous problems requiring BI solutions. Is able to probe assumptions, illuminate pitfalls, and align teams toward coherent architectural and analytical strategies.
* Can propose projects that may require the work of several development teams to implement. Is able to divide responsibilities so that each team can work independently and have the system come together into an integrated whole.
* Artifacts set the standard in their organization for excellence, from designs to algorithms to implementations to technical documents.
* Reduces coupling between teams. Can understand technical misalignments across businesses and advocate organization/team change. Drives architecture or organization changes to enable teams to work independently and/or achieve a significant efficiency improvement.
* Able to discover new business opportunities and can be assigned to goals where they may not know what the problem is before starting.

1. **What is the business bar for the BIE role?**

The BIE is conversant in both technical and business language, appropriate for their level. They can translate business needs into technical designs, and vice versa. The BIE interacts with partners and stakeholders with clear and timely communication in appropriate level of business or technical language. The BIE contributes to business documents (e.g. PR/FAQs, narratives, etc.). The BIE must be able to discover the business intent of stakeholders, estimate and communicate feasibility, and create a roadmap for the solution. BIEs are able to contribute to the goal-setting of business partners based on their knowledge of the limitations and opportunities of available technology.

1. **Why would I hire a Data Engineer, Data Scientist, or Business Analyst instead of a BIE?**

The BIE is a generalist role with a degree of foundational knowledge that spans data engineering, science, and business analysis. As such, the BIE becomes a specialist in data lineage: including the technical systems by which the data is generated; how metrics are aggregated; how scientists extract deep insights from the data; and how the resulting business intelligence is consumed, interpreted and acted upon by the business. More than the other data roles, the BIE is a subject matter expert in the data itself. As businesses and technologies grow, a generalist may not be enough: the work may require specialized skills, or larger businesses may require dedicated data engineer, scientist, and analyst functions (in addition to BIEs). For a productive organization design that delivers for our customers, it is important for senior leaders, hiring managers, and the BIEs themselves to understand the various data role distinctions to assign resources effectively.

1. **How is BIE different than other data roles?**

While there may be overlap in some day-to-day functions, the roles are distinct. The BIE works with stakeholder data consumers to define requirements for metrics or data products, gathers data sources, applies transforms, and builds the BI solution, with ownership handed off or maintained by the BIE. This differs from the Data Engineer who builds data persistence solutions for the larger organization, defines processing technologies to be used, owns the overall data architecture, and generally does not consume or interpret downstream data products. Business Analysts specialize in a business domain, and are usually primary consumers of BI solutions who dive deep into metrics to communicate root causes or analyze business implications of data outputs. Data Scientists are specialists in the application of statistics or machine learning to business problems; they deliver artifacts that can automate decisions, generate inferences or make predictions from data to drive business operations or decisions.

**Appendix 1: Common Terminology**

1. A software **component** isa building block that does not solve a customer or business problem on its own, but is part of a solution. A piece of technology with a clearly defined interface that is indivisible, has minimal internal dependencies, and deliverable (somewhat) independently.
2. **Architecture** is a set of components and features that delight customers or solve a problem. Design includes when to build, refactor, or deprecate. BI Architecture specifically is the design, structure and automation of data pipelines, aggregate/denormalized tables, and report/dashboard templates.
3. **BI Solution** is a data pipeline, analysis, dashboard, report, or similar artifact that answers business requirements.
4. **Team** is defined as the group reporting to a line manager (e.g., classic two-pizza team with < 10 people)
5. **Organization** (Org) - a group of teams that together provide one or more product(s) or business function(s).
6. **Tactical** is when someone takes action(s) to achieve specific goals. Actions can be implemented as one or more specific tasks or projects. Includes setting priorities and success measurements, making *short-term* trade-offs and either implementing or engaging with others to deliver.
7. **Strategic** is a leadership skill. Includes defining a mission, vision, tenets, and long-term priorities. Includes ensuring that stakeholders, leaders, and others are working toward common goals. Requires judgement and experience to make appropriate *short-term* vs. *long-term* trade-offs.
8. **Straightforward** problems/efforts have minimal visible risks or roadblocks. *What* to accomplish is clear (and does not appear complicated). *How* to accomplish is not clear (the employee uses their knowledge and skill to figure that out).
9. **Difficult** problems/efforts have visible risks and/or roadblocks. The work requires employee skill to implement, mitigate the risks, and overcome the roadblocks. It takes more work to deliver results because of the challenges involved.
10. **Complex** problems/efforts have visible risks, roadblocks, and *constraints*. The employee has to mitigate the risks, overcome the roadblocks, and design an appropriately simple solution that addresses the constraints. Often requires making trade-offs that require expertise, judgment, and some ability to influence others to reach consensus on the right solution.
11. **Significantly complex** problems/efforts have visible and not-yet-visible risks, roadblocks, constraints, and many *conflict* with each other (i.e., resolution of one issue creates a conflict with the resolution of another; multiplied by the number of issues). Requires significant expertise to make the right trade-offs, and design a solution that is appropriately simple (doesn’t add to the complexity). Due to the stakeholders involved (i.e., those blocking or driving the constraint) achieving alignmenton an approach or implementation is more challenging and the trade-offs made usually have long-term impacts.
12. **Code** is defined as a series of program instructions that executes or automates computer commands. BIE examples include: data processing and analysis commands (e.g. extracts, transformations, scheduling, data validation, analysis, and visualizations).
13. **Service Level Agreement** (SLA)
14. **Lifecycle** extends from idea to design, to justification and approval, to build and launch, to the continued innovation of the system, to eventual migration to newer solutions and deprecation of older ones.

1. **Straightforward** describes problems/efforts with minimal visible risks or roadblocks. What to accomplish is clear (and does not appear complicated). How to accomplish is not clear (the employee uses their knowledge and skill to figure that out). [↑](#footnote-ref-1)
2. **Tactical** is when someone takes action(s) to achieve specific goals. Actions can be implemented as one or more specific tasks or projects. Includes setting priorities and success measurements, making short-term trade-offs and either implementing or engaging with others to deliver. [↑](#footnote-ref-2)
3. **Difficult** describes problems/efforts with visible risks or roadblocks. The work requires employee skill to implement, mitigate the risks and overcome the roadblocks. It takes more work to deliver results because of the challenges involved. [↑](#footnote-ref-3)
4. **Strategic** is a leadership skill. Includes defining a mission, vision, tenets, and long-term priorities. Includes ensuring that stakeholders, leaders, and others are working toward common goals. Requires judgement and experience to make appropriate short-term vs. long-term trade-offs. [↑](#footnote-ref-4)
5. **Complex** describes problems/efforts with visible risks, roadblocks, and some constraints. The employee has to mitigate the risks, overcome the roadblocks, and design an appropriately simple solution that addresses the constraints. Often this requires them to make trade-offs that require expertise, high judgment, and (typically) some ability to influence others to reach consensus on the right solution. For more detail, see the Glossary in the appendix of this guideline. [↑](#footnote-ref-5)
6. **Significantly complex** describes problems/efforts with visible and not-yet-visible risks, roadblocks, constraints, and many conflict with each other (i.e., resolution of one issue creates a conflict with the resolution of another issue; multiplied by the number of issues). Requires significant expertise to see around corners, make the right trade-offs, and design a solution that is appropriately simple (doesn’t add to the complexity). Due to the stakeholders involved (i.e., those blocking or driving the constraint, senior leaders, etc.) achieving alignment on an approach or implementation is more challenging and the trade-offs made usually have long-term impacts. [↑](#footnote-ref-6)