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APPENDIX

Work Breakdown Structure

The work breakdown structure in this appendix reflects the contents of the enclosed CD-ROM.

TASK_DATA

ID	*Task_Name*	*Predecessors*
1	**Your Project Name**	
2	**Step 1: Business Case Assessment**	
3	**Determine the business need**	
4	Identify the business need	
5	Determine current financial consequences of the business need	
6	**Assess the current decision-support system (DSS) solutions**	3
7	Assess current usage of the existing DSS	
8	Determine the shortcomings of the existing DSS	
9	Perform gap analysis	
10	**Assess the operational sources and procedures**	3
11	**Assess the data quality of operational systems**	
12	Review file structures and databases	
13	Review content (domain) of source data elements	
14	**Assess the current data movement**	
15	Review data entry practices	
16	Review data extraction practices	
17	Review data manipulation practices	
18	Review data duplication practices	
19	**Assess current operational procedures**	
20	Identify poor data entry practices	

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ID	Task_Name	Predecessors
21	Identify lack of edit checks	
22	Identify defective program code	
23	Identify lack of training	
24	**Assess the competitors' BI decision-support initiatives**	3
25	Determine the competitors' successes and failures	
26	Determine whether competitors gained market advantages	
27	**Determine the BI application objectives**	6, 10, 24
28	Identify the strategic business goals of the organization	
29	Define the overall BI decision-support objectives	
30	Define the project-specific BI application objectives	
31	Match the overall BI decision-support objectives to the strategic business goals	
32	Match the project-specific BI application objectives to the strategic business goals	
33	**Propose a BI solution**	27
34	Review current DSS solutions	
35	Review DSS gap analysis	
36	Determine how the BI application will lessen the business pain	
37	Create a high-level architecture for the proposed BI solution	
38	Consolidate and prioritize unfulfilled requirements from previous BI projects	
39	Create a high-level (conceptual) logical data model	
40	**Perform a cost-benefit analysis**	27
41	Determine costs	
42	**Determine benefits (tangible and intangible)**	
43	Identify short-term benefits to the organization	
44	Identify long-term benefits to the organization	
45	Calculate the projected return on investment (ROI)	41, 42
46	**Perform a risk assessment**	27
47	**Create a risk assessment matrix**	
48	List the technology risks	
49	List the complexity risks	

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ID	Task_Name	Predecessors
50	List the integration risks	
51	List the organization risks	
52	List the project team risks	
53	List the financial investment risks	
54	Assign weights to the risks	47
55	Rank the risks: low, medium, or high	54
56	Determine the risks (ramifications) of not implementing a BI solution	54
57	**Write the assessment report**	33, 40, 46
58	Describe the business need	
59	Describe lost opportunities	
60	Describe the proposed BI solution	
61	State the cost justification and expected ROI	
62	Include risk assessment results	
63	Write recommendations (include operational business process improvements)	
64	Obtain project approval from business sponsor	57
65	**Step 2: Enterprise Infrastructure Evaluation**	
66	**Section A: Technical Infrastructure Evaluation**	
67	**Assess the existing platform**	64
68	Review hardware	
69	Review operating systems	
70	Review middleware, especially DBMS gateways	
71	Review custom interfaces	
72	Review network components and bandwidth	
73	Review the DBMS	
74	Review tools (CASE, ETL, OLAP, etc.)	
75	Review the meta data repository	
76	Perform gap analysis	
77	**Evaluate and select new products**	64
78	Identify the product categories you need to evaluate (hardware, DBMS, tools)	

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ID	Task_Name	Predecessors
79	List all products being considered for each category	
80	Itemize your requirements for the products	
81	Weigh each product requirement (scale of 1 to 10)	
82	Rank each product against the weighted requirements (scale of 0 to 10)	81
83	Determine the total score for each product	82
84	List all vendors of all products	
85	Itemize your requirements for the vendors	
86	Weigh each vendor requirement (scale of 1 to 10)	
87	Rank each vendor against the weighted requirements (scale of 0 to 10)	86
88	Determine the total score for each vendor	87
89	Evaluate the product scores and vendor scores	83, 88
90	Create a short list of products and vendors in each category	89
91	Have the products demonstrated by the vendors	90
92	Choose the final product in each product category	91
93	Obtain business sponsor approval to license the products	92
94	**Write the technical infrastructure assessment report**	67, 77
95	Itemize findings about servers, operating systems, middleware, etc.	
96	List the weighted requirements	
97	List the product scores	
98	List the vendor scores	
99	List the product costs	
100	List the products on the short list	
101	Explain the rationale for selecting or rejecting products	
102	Explain the final selection criteria	
103	Write the executive summary	
104	**Expand the current platform**	94
105	Order new products	
106	Install new products	105
107	Test new products	106

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ID	Task_Name	Predecessors
108	Train technical staff on new products	106
109	**Section B: Nontechnical Infrastructure Evaluation**	
110	**Assess the effectiveness of existing nontechnical infrastructure components**	57
111	Review standards for data naming, abbreviations, modeling, etc.	
112	Review the use of the development methodology	
113	Review estimating guidelines	
114	Review change-control procedures	
115	Review issues management procedures	
116	Review roles and responsibilities	
117	Review security processes and guidelines	
118	Review meta data capture and delivery processes	
119	Review meta data repository functionality	
120	Review the process for merging logical data models into the enterprise data model	
121	Review data quality measures and the cleansing triage process	
122	Review the service-level agreement (SLA) process	
123	Review the BI support function	
124	Review the dispute resolution process	
125	Review the communication process	
126	Perform gap analysis	
127	**Write the nontechnical infrastructure assessment report**	110
128	Itemize findings about inadequate standards, guidelines, procedures, etc.	
129	Write recommendations for nontechnical infrastructure changes	
130	Prioritize nontechnical infrastructure requirements for the BI project	
131	Prioritize nontechnical infrastructure requirements for outside the BI project	
132	Write the executive summary	
133	**Improve the nontechnical infrastructure**	127
134	Create time estimates for creating or modifying new standards, guidelines, procedures	
135	Change the guidelines for using the development methodology	
136	Modify the roles and responsibilities	

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ID	Task_Name	Predecessors
137	Create new processes as needed	
138	**Step 3: Project Planning**	
139	**Determine the project requirements**	94, 127
140	Define data requirements	
141	Define functional requirements (reports, queries, online help function)	
142	Define infrastructure requirements (technical and nontechnical)	
143	Expand or create the high-level logical data model	140
144	Validate the requirements with other business people	140, 141, 142
145	Obtain sponsor approval for the requirements	144
146	**Determine the condition of the source files and databases**	139
147	Review the content of each potential source file and source database (internal and external)	
148	**Assess source data violations**	
149	Review technical data conversion rules	
150	Review business data domain rules	
151	Review business data integrity rules	
152	Determine which data elements are critical, important, insignificant	
153	Estimate the time needed for cleansing of critical source data	152
154	Estimate the time needed for cleansing of important source data	152
155	Review data-cleansing estimates with the business sponsor and prioritize the cleansing effort	153, 154
156	**Determine or revise the cost estimates**	146
157	Review the technical infrastructure assessment report	
158	Review the nontechnical infrastructure assessment report	
159	Review the project requirements	
160	Review the project constraints (time, scope, budget, resources, quality)	
161	Review the need for consulting, contracting, training	
162	Revise the original cost estimates	161
163	**Revise the risk assessment**	146
164	Review and revise the original risk assessment matrix	
165	Determine the likelihood of the risks materializing: low, medium, high	

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ID	Task_Name	Predecessors
166	Determine the impact of every risk: low, medium, high	
167	Define triggers	
168	Define a risk mitigation plan	
169	Define a contingency plan	
170	Identify your assumptions	
171	Include assumptions as risks on the contingency plan	
172	Review the project constraints as they relate to risk	
173	**Identify critical success factors**	156, 163
174	Define the success criteria for the BI project	
175	Determine critical success factors	174
176	Review critical success factors with the business sponsor	175
177	Obtain agreement and cooperation on the critical success factors from the business sponsor	176
178	**Prepare the project charter**	173
179	State the purpose and reason for the BI project	
180	State costs and benefits	
181	Describe infrastructure and business process improvements	
182	Describe the high-level scope (data and functions)	
183	List items not in the scope	
184	List expectations from the business people (preliminary SLA)	
185	Define team structure, roles, and responsibilities	
186	List risks, assumptions, and constraints	
187	List critical success factors	
188	**Create a high-level project plan**	173
189	Create a work breakdown structure	
190	Determine base estimates for all tasks	
191	Identify task dependencies	
192	**Revise the base estimates for assigned resources**	191
193	Address skill level	
194	Address subject matter expertise	

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ID	Task_Name	Predecessors
195	Address additional administrative activities	
196	Address non-work-related activities	
197	Identify resource dependencies (resource leveling)	192
198	Create a critical path method (CPM) or Pert chart	197
199	Create a Gantt chart	197
200	**Kick off the project**	178, 188
201	Prepare an agenda for the kickoff meeting	
202	Call a kickoff meeting	201
203	Assign roles and responsibilities to core team members	202
204	Identify extended team members and review their responsibilities	202
205	Discuss the project charter	202
206	Walk through the project plan	202
207	Discuss the concept of self-organizing teams	202
208	**Step 4: Project Requirements Definition**	
209	**Define the requirements for technical infrastructure enhancements**	200
210	Define the requirements for additional hardware	
211	Define the requirements for additional middleware	
212	Define the requirements for a new DBMS or upgrades to the existing DBMS	
213	Define the requirements for the network or upgrades to it	
214	Determine the security requirements	
215	Define the requirements for development tools (CASE, ETL)	
216	Define the requirements for data access and reporting tools (OLAP, report writers)	
217	Define the requirements for a new data mining tool	
218	Determine whether to license or build a meta data repository	
219	Determine how to enhance an existing meta data repository	
220	**Define the requirements for nontechnical infrastructure enhancements**	200
221	Define the requirements for governance (prioritizing) standards and procedures	
222	Define the requirements for the development methodology	
223	Define the requirements for estimating guidelines	

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ID	Task_Name	Predecessors
224	Define the requirements for the scope management process	
225	Define the requirements for the issues management process	
226	Define the requirements for roles and responsibilities	
227	Define the requirements for the security process	
228	Define the requirements for the meta data capture and delivery process	
229	Define the requirements for logical data modeling	
230	Define the requirements for the data cleansing process	
231	Define the requirements for the testing procedures	
232	Define the requirements for the SLA process	
233	Define the requirements for the BI support function	
234	Define the requirements for the dispute resolution process	
235	Define the requirements for the communication process	
236	**Define the reporting requirements**	200
237	Collect or create sample report layouts	
238	Collect or create sample queries	
239	Define business rules for the reports	
240	Define aggregation and summarization rules	
241	Define reporting dimensions	
242	Define query libraries	
243	Identify stewards of the libraries	
244	Get samples of ad hoc queries (if possible)	
245	Define access interfaces	
246	**Define the requirements for source data**	200
247	Define all source data elements	
248	Classify data elements as critical, important, insignificant	
249	Define the data domains (allowable values)	
250	Define the significant and obvious business rules for the data	
251	Determine the data-cleansing requirements	
252	Define the historical data requirements	

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ID	Task_Name	Predecessors
253	**Review the project scope**	209, 220, 236, 246
254	Compare the detailed project requirements to the high-level scope in the project charter	
255	Review the project constraints (time, scope, budget, resources, quality)	
256	Determine whether the scope is realistic under those constraints	
257	Renegotiate the scope, if necessary	256
258	Create a change-control document	
259	Create an issues log	
260	**Expand the logical data model**	253
261	Add newly discovered entities and relationships	
262	Refine the logical data model by resolving the many-to-many relationships	261
263	Add unique identifiers to each entity	262
264	Attribute the logical data model with critical data elements	262
265	**Define preliminary service-level agreements**	253
266	Identify or revise the expectations for availability	
267	Identify or revise the expectations for security	
268	Identify or revise the expectations for response time	
269	Identify or revise the expectations for data cleanliness	
270	Identify or revise the expectations for ongoing support	
271	**Write the application requirements document**	260, 265
272	Describe the technical infrastructure requirements	
273	Describe the nontechnical infrastructure requirements	
274	Describe the reporting requirements	
275	Describe the ad hoc and canned query requirements	
276	Describe the requirements for source data, including history	
277	Describe the data-cleansing requirements	
278	Describe the security requirements	
279	List the preliminary SLAs	

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ID	Task_Name	Predecessors
280	**Step 5: Data Analysis**	
281	**Analyze the external data sources**	271
282	Identify entities and relationships from each external data source	
283	Merge the new entities and relationships from the external data sources into the logical data model	
284	**Refine the logical data model**	271, 281
285	Fully attribute the logical data model to include all required source data elements	
286	Create new entities and relationships where needed to store the new attributes	
287	Analyze the layout of all identified source files and source databases	
288	Analyze the content of all identified source data elements	
289	Create the data-specific business meta data components	
290	**Analyze the source data quality**	271, 281
291	**Apply business data domain rules and business data integrity rules**	
292	Look for default values	
293	Look for missing values	
294	Look for cryptic values	
295	Look for contradicting values	
296	Look for values that violate the business rules	
297	Look for missing primary keys	
298	Look for duplicate primary keys	
299	Determine the severity of the problem	
300	Determine the criticality of the problem	
301	**Expand the enterprise logical data model**	284, 290
302	Merge the project-specific logical data model into the enterprise logical data model	
303	Identify data discrepancies and inconsistencies between the logical data models	
304	**Resolve data discrepancies**	290
305	Discuss the discrepancies with data owners and other business executives	
306	Adjust either the project-specific logical data model or the enterprise logical data model	
307	Notify other affected project teams	

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ID	Task_Name	Predecessors
308	Document the discrepancies as meta data and schedule time for resolutions	
309	**Write the data-cleansing specifications**	304
310	Review the classification of data elements: critical, important, insignificant	
311	Write data-cleansing specifications for all critical data elements	
312	Write data-cleansing specifications for selected important data elements	
313	**Step 6: Application Prototyping**	
314	**Analyze the access requirements**	271
315	**Review the application requirements document with the subject matter expert and the business representative**	
316	Analyze the report requirements	
317	Analyze the query requirements	
318	Analyze the ad hoc requirements	
319	Analyze the interface requirements	
320	Communicate all your findings to the database administrator	
321	**Create a skill set matrix for each business person participating in the prototyping activities**	
322	Indicate computer skill level: beginning, advanced, expert	
323	Indicate application knowledge: beginning, advanced, expert	
324	**Determine the scope of the prototype**	271
325	Determine the objective and the primary use of the prototype	
326	Decide which type of prototype to build (show-and-tell, demo, etc.)	
327	Select a subset of functions (reports, queries, ETL, interface)	
328	Select a subset of sample data from source files and source databases	
329	Create a change-control document for the prototype	
330	Create an issues log for the prototype	
331	Determine the number of prototype iterations	
332	Determine the number of prototype participants	
333	Determine the time limits for each prototype iteration	331
334	Estimate the cost and benefit for each prototype iteration	331
335	Determine the point of diminishing returns for prototyping	331

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ID	Task_Name	Predecessors
336	**Select tools for the prototype**	271
337	Review existing in-house tools and find out who uses them	
338	Review the availability of new reporting and querying tools	
339	Review existing or new graphical tools	
340	Review existing or new report distribution tools	
341	Review existing DBMS options for the prototype	
342	Select the platform on which the prototype will be developed	
343	Select one of the installed and tested DBMSs	
344	Select one or more existing or new tools	
345	Determine training needs for the new tools	
346	Schedule training sessions	345
347	**Prepare the prototype charter**	314, 324, 336
348	State the purpose of the prototype	
349	State what type of prototype you selected	
350	List who will participate (IT and business people)	
351	Define what the rules are (scope, time, iterations)	
352	Define how you will measure the success of the prototype	
353	**Design the reports and queries**	347
354	Design the reports	
355	Design the queries	
356	Design the interfaces	
357	Create a physical data model (database design) for the prototype database	
358	Identify the data to be used for the prototype	
359	Map sample source data or new test data into the prototype database	358
360	**Build the prototype**	347
361	Create the physical prototype database	
362	Create sample test data	
363	Load the prototype database with sample data	
364	Write a selected subset of reports	

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ID	Task_Name	Predecessors
365	Write a selected subset of queries	
366	Write a selected subset of interfaces or other functions	
367	Test reports, queries, interfaces, or other functions	364, 365, 366
368	Document any problems with the tool	367
369	Document any issues with the reports or queries	367
370	Document any issues with the interfaces or other functions	367
371	Document any issues with dirty source data	367
372	Validate the time and cost estimates for the BI application	367
373	**Demonstrate the prototype**	353, 360
374	Review reports and queries with the business people	
375	Review problems and issues with the business sponsor and the business representative	
376	Review the project requirements with the subject matter expert and the business representative	
377	Document requested changes in the change-control document	
378	Analyze the impact of requested changes on other constraints (time, quality, cost, resources)	377
379	Review impact of requested changes with the business sponsor and the business representative	378
380	Revise the application requirements document to include approved changes	379
381	Review lessons learned with the entire project core team and in particular with the ETL step core team	380
382	Use prototype demonstrations to promote the BI application	380
383	Perform the next prototype iteration, if applicable	373
384	**Step 7: Meta Data Repository Analysis**	
385	**Analyze the meta data repository requirements**	271
386	Review the technical infrastructure assessment report	
387	Perform a cost-benefit analysis for licensing versus building a meta data repository	
388	Make the decision to license or build a meta data repository	387
389	Review the nontechnical infrastructure assessment report	
390	Determine the scope of the meta data repository deliverables	

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ID	Task_Name	Predecessors
391	Prioritize the meta data repository deliverables	390
392	Update the application requirements document to reflect any changes	391
393	**Analyze the interface requirements for the meta data repository**	271
394	**Analyze the meta data sources**	
395	Analyze word processing files and spreadsheets	
396	Analyze DBMS dictionaries	
397	Analyze CASE, ETL, OLAP tools	
398	Analyze report writers and query tools	
399	Analyze the data mining tool	
400	Determine what import and export features are available in these tools	
401	Determine what import and export features are available in the meta data repository product	
402	**Analyze the meta data repository access and reporting requirements**	271
403	Review the original meta data repository access and reporting requirements	
404	Review the meta data security requirements	
405	Identify the access interface media (PDF, HTML)	
406	Analyze the feasibility of a context-sensitive help function	
407	Determine what reports should be produced from the meta data repository	
408	**Create the logical meta model**	385, 393, 402
409	Create business meta data entities	
410	Create technical meta data entities	
411	Determine the relationships between the meta data entities	
412	Create attributes for business and technical meta data entities	
413	Draw an entity-relationship diagram	
414	**Create the meta-meta data**	
415	**Describe all meta data entities**	408
416	Name the meta data entities	
417	Define all meta data entities	
418	Define the relationships between all meta data entities	

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ID	Task_Name	Predecessors
419	Define the security for meta data entities	
420	Define the physical location for meta data entities	
421	Define timeliness for meta data	
422	Define volume for meta data entities	
423	**Describe all meta data attributes**	415
424	Name the meta data attributes	
425	Define all meta data attributes	
426	Define type and length for meta data attributes	
427	Define the domain for meta data attributes	
428	Define the security for meta data attributes	
429	Define ownership for meta data attributes	
430	Define the business rules for meta data entities, attributes, and relationships	423
431	**Step 8: Database Design**	
432	**Review the data access requirements**	309, 373
433	Review the data-cleansing specifications	
434	Review the prototyping results	
435	**Review detailed access and analysis requirements**	
436	Review detailed reporting requirements	
437	Review detailed querying requirements	
438	Review known ad hoc querying requirements	
439	Review data security requirements	
440	Determine projected data volumes and growth factors	
441	Determine the projected number of concurrent database usages	
442	Determine the location of business people	
443	Determine the frequency of report and query executions	
444	Determine the peak and seasonal reporting periods	
445	Determine platform limitations	
446	Determine tool limitations (ETL, OLAP, report writers)	

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ID	Task_Name	Predecessors
447	**Determine the aggregation and summarization requirements**	309, 373
448	Review measures (facts) used by the prototype	
449	Review the dimensions used by the prototype	
450	Review the drill-down and roll-up functions of the prototype	
451	Review common reporting patterns among existing reports	
452	Determine the most frequently used reporting dimensions	
453	Review the logical data model with the data administrator	
454	Determine the level of detail (granularity) needed	
455	Determine how the detailed data will be accessed (drill-down or ad hoc)	
456	Determine how many business relationships (entity relationships) will be needed	
457	**Design the BI target databases**	435, 447
458	Determine the appropriate database design schemas (multidimensional or entity-relationship)	
459	Create the physical data models (database design diagrams)	
460	Create the technical meta data for the physical data models	459
461	Map the physical data models to the logical data model	459
462	**Design the physical database structures**	457
463	Determine how to cluster the tables	
464	Determine the placement of datasets	
465	Determine how to stripe disks	
466	Determine how to partition the tables across multiple disks	
467	Determine how much free space to choose	
468	Determine how much buffer space to declare	
469	Determine how large to set the blocksize	
470	Determine the most appropriate indexing strategy	
471	Determine whether referential integrity will be enforced by the DBMS	
472	**Build the BI target databases**	462
473	**Create the data definition language (DDL)**	
474	Define storage groups	

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ID	Task_Name	Predecessors
475	Define databases	
476	Define partitions	
477	Define tablespaces	
478	Define tables	
479	Define columns	
480	Define primary keys	
481	Define foreign keys	480
482	Define indices	480
483	**Create the data control language (DCL)**	473
484	Define parameters for the security SYSTABLE	
485	Set up group IDs	
486	Grant CRUD (create, read, update, delete) authority to group IDs	
487	Assign developers, business analysts, and programs to the appropriate group IDs	
488	Run the DDL to create the physical database structures	473
489	Run the DCL to grant authority to the physical database structures	483
490	Build the indices	488
491	**Develop database maintenance procedures**	483
492	**Define database maintenance activities**	
493	Define database backups (full and incremental backups)	
494	Define disaster recovery procedures	
495	Define reorganization procedures for fragmented tables	
496	Define the frequency of and procedure for performance monitoring activities	
497	**Prepare to monitor and tune the database designs**	491
498	Plan to monitor the performance of ETL loads, reports, and queries at runtime	
499	Plan to use a performance-monitoring utility to diagnose performance degradation	
500	Plan to refine the database design schemas	
501	Plan to add additional indices, if necessary	
502	**Prepare to monitor and tune the query designs**	491
503	Plan to review and streamline all SQL calls in programs	

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ID	Task_Name	Predecessors
504	Plan to write pass-through queries for OLAP tools, if necessary	
505	Plan to utilize parallel query execution	
506	**Step 9: Extract/Transform/Load Design**	
507	**Create the source-to-target mapping document**	491
508	Review the record layouts for the source files	
509	Review the data description blocks for the source databases	
510	Review the data-cleansing specifications for source data elements	
511	Create a matrix for all target tables and target columns	
512	List all applicable source files and source databases for every target table	
513	List all relevant source data elements for every target column	
514	List data type and length for every target column	
515	List data type and length for every source data element	
516	**Write transformation specifications for populating the columns**	514, 515
517	Combine data content from multiple sources (if needed)	
518	Split data content from one data element across multiple columns (if needed)	
519	Include aggregation and summarization algorithms	
520	Include data-cleansing specifications for each column	
521	Include logic for checking referential integrity (if not performed by the DBMS)	
522	Include logic for error messages and record rejection counts	
523	Include logic for reconciliation totals (record counts, domain counts, amount counts)	
524	**Test the ETL tool functions**	491
525	Review the transformation specifications in the source-to-target mapping document	516
526	Determine whether the ETL tool functions can perform the required transformation logic	525
527	Determine what supplementary custom code must be written	526
528	**Design the ETL process flow**	507, 524
529	Determine the most efficient sequence to extract source data	
530	Determine the most efficient sequence to transform, cleanse, and load the data	
531	Determine the sort and merge steps in the ETL process	
532	Identify all temporary and permanent work files and tables	

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ID	Task_Name	Predecessors
533	Determine what components of the ETL process can run in parallel	
534	Determine what tables can be loaded in parallel	
535	**Draw the process flow diagram**	533, 534
536	Show the extracts from source files and source databases	
537	Indicate temporary and permanent work files and tables	
538	Show the sort and merge processes	
539	Show the transformation programs	
540	Show the error rejection files and error reports	
541	Show the load files and load utilities	
542	**Design the ETL programs**	528
543	**Design three sets of ETL programs**	
544	Design the initial load programs	
545	Design the historical load programs	
546	Design the incremental load programs	
547	Modularize the ETL programs	
548	Translate the transformation specifications into programming specifications	547
549	**Set up the ETL staging area**	528
550	Determine whether and how to distribute the ETL process	
551	Set up the ETL server	
552	Allocate space for temporary and permanent work files and tables	551
553	Create program libraries	551
554	Establish program-versioning procedures	551
555	**Step 10: Meta Data Repository Design**	
556	**Design the meta data repository database**	414
557	Review the logical meta model for the meta data repository	
558	Design the meta data repository database (entity-relationship or object-oriented)	
559	Draw the physical meta model diagram (entity-relationship or object-oriented)	
560	Map the physical meta model to the logical meta model	
561	Create the DDL for the meta data repository database	

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ID	Task_Name	Predecessors
562	Create the DCL for the meta data repository database	
563	Design backup and recovery procedures	
564	Design versioning and archival procedures	
565	**Install and test the meta data repository product**	414
566	Compile a list of meta data repository products and vendors	
567	Compare the meta data repository products to the meta data repository requirements	
568	Create a scorecard for each evaluated meta data repository product	
569	Create a scorecard for each evaluated meta data repository vendor	
570	Narrow the list of meta data repository products and vendors to a short list	568, 569
571	Arrange for meta data repository product demos	
572	Check the vendors' client references	
573	License the meta data repository product	572
574	Install and test the meta data repository product	573
575	**Design the meta data migration process**	556, 565
576	Analyze all sources for extracting business meta data	
577	Analyze all sources for extracting technical meta data	
578	Design the tool interface process	
579	Design the transformations for the extracted meta data	
580	Design the load programs for the meta data repository	
581	**Write the programming specifications for the meta data migration process**	
582	Write tool interface programming specifications	578
583	Write transformation programming specifications	579
584	Write meta data repository load programming specifications	580
585	**Design the meta data application**	556
586	Design the meta data repository report programs	
587	Design the media for displaying meta data ad hoc query results	
588	Design the access interface process	
589	Design the context-sensitive online help function	

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ID	Task_Name	Predecessors
590	**Write the programming specifications for the meta data application**	
591	Write report programming specifications	586
592	Write query script specifications	587
593	Write access interface programming specifications	588
594	Write online help function programming specifications	589
595	**Step 11: Extract/Transform/Load Development**	
596	**Build and unit test the ETL process**	542, 549
597	Code the ETL programs	
598	If using an ETL tool, write instructions for the ETL tool modules	
599	Capture the ETL technical meta data for the meta data repository	
600	Write code to produce reconciliation totals, quality metrics, and load statistics	
601	Unit test each individual program module	597, 600
602	If using an ETL tool, unit test each ETL tool module	598, 600
603	Write the scripts to execute the ETL programs and the sort, merge, and load utilities	601, 602
604	**Integration or regression test the ETL process**	596
605	Create a test plan with test cases for the ETL process	
606	Create test data for the ETL programs	
607	Integration or regression test the entire ETL process	605, 606
608	Log the actual test results and document any test issues	605, 606
609	Compare actual test results with expected test results	605, 606
610	Revise the ETL programs (or the instructions for the ETL tool)	609
611	Retest the entire ETL process from beginning to end	610
612	**Performance test the ETL process**	604
613	Test individual ETL programs and tool modules that read or write to high-volume tables	
614	Test the parallel execution of ETL programs and tool modules against high-volume tables	
615	Test the ETL programs and ETL tool modules that perform complicated operations	
616	Use full-volume data for performance testing	
617	If using a stress test simulation tool, define test components and run a simulation test	

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ID	Task_Name	Predecessors
618	**Quality assurance (QA) test the ETL process**	612
619	Move all ETL programs into the QA environment	
620	QA test the entire ETL process from beginning to end	619
621	Obtain approval from the operations staff to move the ETL process into production	620
622	**Acceptance test the ETL process**	612
623	**Acceptance test the entire ETL process from beginning to end**	
624	Validate all cleansing transformations	
625	Validate error-handling routines	
626	Validate reconciliation totals	
627	Obtain certification for the ETL process from the business representative	623
628	**Step 12: Application Development**	
629	**Determine the final project requirements**	491
630	Review the results of the prototype	
631	Review the prototyping programs and scripts	
632	Review the change-control document	
633	Review the issues log	
634	Review existing and mock-up report layouts	
635	Review existing spreadsheets	
636	Review the latest version of the application requirements document	
637	Agree on the final project requirements	
638	Update the application requirements document to reflect any changes	637
639	**Design the application programs**	491
640	Design the final reports	
641	Design the final queries	
642	Design the front-end interface (GUI, Web portal)	
643	Design the online help function	
644	**Write programming specifications**	
645	Write report programming specifications	640
646	Write query script specifications	641

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ID	Task_Name	Predecessors
647	Write front-end interface programming specifications	642
648	Write online help function programming specifications	643
649	Create a test plan with test cases and a test log	645, 646
650	**Build and unit test the application programs**	639
651	Create sample test data	
652	Load the development databases with sample test data	
653	Rewrite or enhance prototyping programs and scripts	
654	Code the final report programs	
655	Code the final query scripts	
656	Code the final front-end interface programs	
657	Code the online help function programs	
658	Unit test each individual program module	654, 655, 656, 657
659	**Test the application programs**	650
660	**Integration or regression test all programs and scripts from beginning to end**	
661	Integration or regression test report programs	
662	Integration or regression test query scripts	
663	Integration or regression test front-end interface programs	
664	Integration or regression test online help function programs	
665	Log the actual test results and document any test issues	
666	Compare actual test results with expected test results	
667	Revise the application programs and scripts	666
668	Retest the application programs and scripts from beginning to end	667
669	Performance test complex high-volume programs	668
670	Use full-volume data for performance testing	668
671	If using a stress test simulation tool, define test components and run a simulation test	668
672	Move databases, programs, and scripts into the QA environment	669
673	QA test the entire application from beginning to end	672
674	Obtain approval from the operations staff to move the application programs into production	673
675	Acceptance test the entire application from beginning to end	669

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ID	Task_Name	Predecessors
676	Obtain certification for the application from the business representative	675
677	**Provide data access and analysis training**	650
678	Identify help desk staff to be trained	
679	Identify "power users" or other business liaison personnel to be trained	
680	Identify business people to be trained	
681	**Create training materials**	
682	Create presentation slides and instructor notes	
683	Create student workbooks with exercises	682
684	Create exercise solutions and other pertinent handouts	683
685	Schedule training sessions	684
686	Conduct training sessions	685
687	Measure training effectiveness	686
688	**Step 13: Data Mining**	
689	**State the business problem**	491
690	Define the business problem	
691	Obtain commitment for a data mining solution	690
692	Set realistic expectations for the data mining tool	691
693	Identify preliminary algorithms relevant to the business problem	691
694	**Collect the data**	689
695	Identify available data sources (operational as well as BI)	
696	Extract pertinent data from various internal data sources	
697	Acquire pertinent data from external data sources	
698	**Consolidate and cleanse the data**	689
699	Merge data from various internal data sources	
700	Match and merge internal data with external data	
701	Review the structure of the merged data	
702	Select a sample of data for each analytical data model	
703	Select related meta data from the meta data repository	
704	Review the data domains and measure the quality and reasonability of data values	702

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ID	Task_Name	Predecessors
705	Validate domain reasonability across active variables	702
706	**Prepare the data**	702
707	Review the frequency distribution of categorical variables	
708	Review maximum, minimum, mean, mode, and median for quantitative variables	
709	Use statistical distribution parameters to filter noise in the data	
710	Eliminate or replace variables with missing values	
711	Convert data formats to suit the particular data mining algorithm used	
712	Derive new variables from original input data	
713	Consolidate customers by assigning a household number to related customers	
714	Relate customers with products and services	
715	Apply data reduction	
716	**Apply data mining transformation techniques**	715
717	Apply "discretization" technique	
718	Apply "one-of-N" technique	
719	**Build the analytical data model**	694, 698, 706
720	Create the analytical (informational) data model	
721	Select data mining operations with the appropriate algorithms	
722	Test accuracy using confusion matrices and input sensitivity analyses	
723	Repeat prior steps to train and retrain the model	722
724	**Interpret the data mining results**	719
725	Review the data mining results	
726	Look for results that are interesting, valid, and actionable	
727	Present the new findings using visualization technology	726
728	Formulate ways in which the new information can be exploited	726
729	**Perform external validation of the results**	719
730	Compare data mining results to published industry statistics	
731	Validate the selection of your variables and time frame against the variables and time frame of the industry statistics	
732	Identify the variations between your analysis results and the industry statistics	

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ID	Task_Name	Predecessors
733	Determine the reasons for the variations	
734	**Monitor the analytical data model over time**	724, 729
735	Keep validating your analytical data model against industry statistics at regular time intervals	
736	When industry statistics change, change your analytical data model and retrain it	735
737	Research the data mining capabilities of your competitors	
738	Monitor your competitors' market share and adjust your model	
739	**Step 14: Meta Data Repository Development**	
740	**Build the meta data repository database**	575, 585
741	Run the DDL to create the physical meta data repository database structures	
742	Run the DCL to grant CRUD authority on the meta data repository database structures	
743	If licensing a meta data repository product, set up CRUD authority on the meta data repository product	
744	Test all meta data repository product components, especially the meta data repository database	
745	**Build and unit test the meta data migration process**	740
746	Code the tool interface programs or use the export facility of the various tools	
747	Code the meta data transformation programs	
748	Code the meta data load programs or use the import facility of the meta data repository product or the DBMS load utility	
749	**Code the meta data programs that will run during ETL**	
750	Code the meta data programs to capture load statistics	
751	Code the meta data programs to capture reconciliation totals	
752	Code the meta data programs to capture data-cleansing metrics	
753	Code the meta data programs to capture rejection counts and reasons for rejections	
754	**Unit test the meta data migration programs**	
755	Unit test the tool interface programs	746
756	Unit test the meta data transformation programs	747
757	Unit the test meta data load programs	748
758	Unit test the meta data programs that will run during the ETL process	749

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ID	Task_Name	Predecessors
759	**Build and unit test the meta data application**	740
760	Code the access interface programs	
761	Code the meta data report programs	
762	Code the meta data query scripts	
763	Code the meta data repository online help function programs	
764	**Unit test the meta data application programs (or meta data repository product modules)**	
765	Unit test the access interface programs	760
766	Unit test the meta data report programs	761
767	Unit test the meta data query scripts	762
768	Unit test the meta data repository online help function programs	763
769	**Test the meta data repository programs or product functions**	745, 759
770	**Create a test plan with test cases**	
771	Create test cases for the meta data migration process	
772	Create test cases for the meta data repository application programs or product modules	
773	Create test cases for the meta data programs that run during the ETL process	
774	**Create test data for meta data repository testing**	
775	Create test data for the meta data migration process	
776	Create test data for the meta data repository application or product modules	
777	Create test data for the meta data programs that run during the ETL process	
778	**Integration or regression test the meta data repository**	770, 774
779	Integration or regression test the meta data migration process	
780	Integration or regression test the meta data repository application or product modules	
781	Integration or regression test the meta data programs that run during the ETL process	
782	Log the actual test results and document any test issues	778
783	Compare actual test results with expected test results	778
784	Revise the meta data repository programs	783
785	Retest the meta data repository programs from beginning to end	784
786	Conduct QA testing with operations staff	785
787	Conduct acceptance testing with the subject matter expert and the business representative	785

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ID	Task_Name	Predecessors
788	**Prepare the meta data repository for production**	769
789	Install and test the server platform for the production meta data repository	
790	Create DDL and DCL for the production meta data repository database	
791	Write operating procedures for the operations staff for running the meta data repository reports	
792	Write a reference guide for the help desk staff and the business people	
793	Develop performance monitoring and tuning procedures for the meta data repository database	
794	Develop meta data repository usage monitoring procedures	
795	**Provide meta data repository training**	769
796	Identify help desk staff to be trained	
797	Identify "power users" to be trained	
798	Identify business people to be trained	
799	**Create meta data repository training materials**	
800	Create meta data repository presentation slides and instructor notes	
801	Create meta data repository student workbooks with exercises	800
802	Create exercise solutions and other pertinent handouts	801
803	Schedule meta data repository training sessions	802
804	Conduct meta data repository training sessions	803
805	Measure meta data repository training effectiveness	804
806	**Step 15: Implementation**	
807	**Plan the implementation**	618, 622, 659, 719, 788
808	Select an implementation (rollout) strategy	
809	Set the implementation date	
810	Determine the number of business people for the initial rollout	
811	Schedule the necessary resources to participate in implementation activities	
812	Schedule the functions to be rolled out	
813	Prepare for organizational impact	

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ID	Task_Name	Predecessors
814	**Set up the production environment**	807
815	Set up the production ETL program library	
816	Set up the production application program library	
817	Set up the production meta data repository program library	
818	Create the production BI target databases	
819	Create the production meta data repository database	
820	Grant appropriate authority on the production BI target databases	818
821	Grant appropriate authority on the production meta data repository database	819
822	Grant appropriate authority on all production program libraries	815, 816, 817
823	Write ETL operating procedures for operations staff	
824	Write application reference guides for help desk staff and the business people	
825	Implement production security levels for all BI application components	
826	**Install all the BI application components**	814
827	**Move ETL programs into the production ETL program library**	
828	Move initial load programs	
829	Move historical load programs	
830	Move incremental load programs	
831	**Move application programs into the production application program library**	
832	Move report programs	
833	Move query scripts	
834	Move front-end interface programs	
835	Move online help function programs	
836	**Move meta data repository programs into the production meta data repository program library**	
837	Move meta data migration programs	
838	Move meta data application programs or product modules	
839	**Set up the production schedule**	814
840	Set up the ETL process on the job scheduler	
841	Add to the job scheduler the meta data programs that run during the ETL process	

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ID	Task_Name	Predecessors
842	Set up on the job scheduler the regularly scheduled application report programs	
843	**Set up on the job scheduler the regularly scheduled meta data repository programs**	
844	Set up the meta data migration process	
845	Set up the meta data repository application	
846	**Load the production databases**	826, 839
847	Run the initial load process	
848	Run the historical load process	
849	Run the meta data migration process	
850	**Prepare for ongoing support**	846
851	Establish a schedule for on-call emergency support	
852	**Schedule database maintenance activities for the production databases**	
853	Schedule database backups	
854	Schedule disaster recovery testing	
855	Schedule database reorganizations	
856	**Schedule database monitoring activities for the production databases**	
857	Schedule performance monitoring activities	
858	Schedule growth monitoring activities	
859	Schedule usage monitoring activities	
860	**Schedule data quality monitoring activities for the BI target databases**	
861	Schedule activities for reviewing meta data metrics	
862	Schedule quality spot checks	
863	**Develop or review capacity plans for the BI platform**	
864	Develop capacity plans for processors	
865	Develop capacity plans for disk storage	
866	Develop capacity plans for network components (including bandwidth)	
867	Start production processing (go live)	850
868	**Step 16: Release Evaluation**	
869	**Prepare for the post-implementation review**	850FS+30 days
870	Review budget expenditures	

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ID	Task_Name	Predecessors
871	Review the original project plan and final schedule	
872	Review the estimated and actual task completion times	
873	Review the issues log (resolved and unresolved issues)	
874	Review the change-control procedure and scope changes	
875	Review unfulfilled requirements (dropped from scope)	
876	Review the effectiveness of the development approach	
877	Review the effectiveness of the team structure	
878	Review the effectiveness of the organizational placement	
879	Review the existing infrastructure (technical and nontechnical)	
880	Identify missing infrastructure pieces (technical and nontechnical)	879
881	Assess the performance of the BI application	
882	Review the effectiveness of training	
883	Review the implementation (rollout) strategy	
884	Review the effectiveness of the release concept	
885	**Organize the post-implementation review meeting**	850FS+30 days
886	**Create the preliminary post-implementation review agenda**	
887	List date, time, and place	
888	List invited attendees	
889	List topics for discussion	
890	List and assign topics for research	
891	List questions to be discussed and answered	
892	Solicit additional topics and questions from attendees	
893	Send out the preliminary agenda to attendees	
894	Schedule the meeting at an off-site location	
895	Arrange facilitation by a third party	
896	Arrange for a third-party scribe to take notes during the meeting	
897	Revise and send the final meeting agenda	893
898	Send out documentation to be discussed during the review	897

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ID	Task_Name	Predecessors
899	**Conduct the post-implementation review meeting**	869, 885
900	Introduce the attendees	
901	Explain the rules for the facilitated session	
902	Discuss each item on the agenda	
903	Document discussions, suggestions, resolutions	
904	Document action items	
905	Assign action items	
906	Establish completion or response date for each action item	
907	**Follow up on the post-implementation review**	899
908	Document unfulfilled requirements to be bundled with the next BI release	
909	Write the meeting minutes	
910	Publish the meeting minutes	
911	Work on assigned action items	
912	Monitor the work performed on action items	
913	Document the action item results	911
914	Publish the action item results	913
915	**Implement nontechnical infrastructure improvements**	
916	Improve the development approach	
917	Improve use of the development methodology	
918	Improve processes and procedures	
919	Improve guidelines	
920	Improve standards	

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