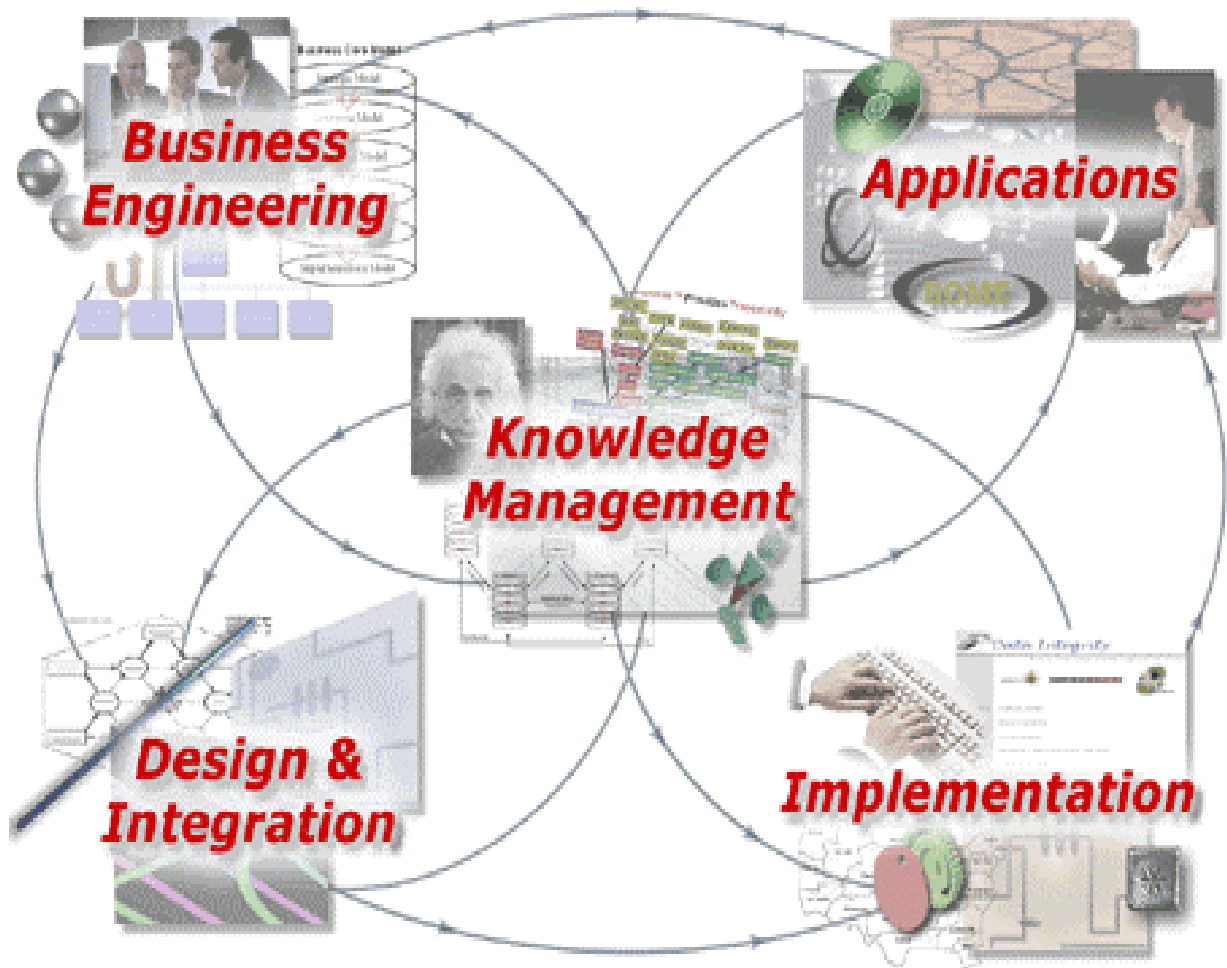


WHITE PAPER

Object Oriented Business Engineering™ An Introduction



Open Engineering Inc.
(415) 989-9050

<http://www.openeng.com>

An Introduction to Object Oriented Business Engineering™

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For more information, please contact Gene Knauer, Director of Sales & Marketing
Open Engineering/San Francisco (415) 989-9050 x17

Open Engineering, Inc.
50 California Street, Suite 860
San Francisco, CA 94111 USA (415) 989-9050
www.openeng.com

Object-Oriented Business Engineering™

Open Engineering, Inc. (OEI) has developed and continues to evolve a unique methodology, Object-Oriented Business Engineering (OOBE®). In essence, OOBE applies key object-oriented software design concepts to the transformation of businesses, enabling them to better cope with the next century's challenges and growth potential. This white paper describes the principles and processes of OOBE. It is intended for audiences evaluating the applicability and benefits of OOBE for their businesses.

Architectural Separation of Concerns

One concept central to OOBE is the principle of a clear architectural separation of concerns. Design of an object-oriented software system often starts by developing an architecture that consists of a small set of self-contained, cooperating subsystems or component frameworks. Attention is placed on insuring that the work performed by each subsystem is unique, and adds significant value to the whole system. Whenever possible, functionality shared between subsystems is separated into its own subsystem. Designing a system this way helps to both manage its complexity and efficiently distribute and share its knowledge and resources. It also facilitates responsiveness to new business requirements through the addition of new, architecturally compliant components.

Many of today's large businesses have grown rapidly, in response to a succession of market opportunities, sometimes including a number of mergers and acquisitions. Consequently, these businesses are not very well organized to respond to the demands of an agile modern economy, where markets, competition and the business environment all change very rapidly.

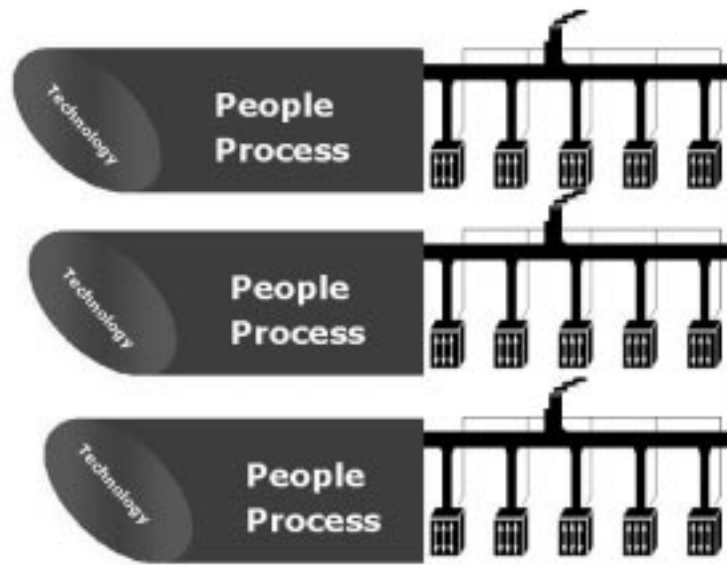


Figure 1 - Silos Inhibit Agility

As shown in Figure 1 above, these businesses often consist of a number of operational silos. Blocked by the walls of these silos and absent an architectural approach to the business, a corporation cannot form an enterprise-wide view of its people, processes and technologies, and effectively reallocate these resources to address new business opportunities.

Abstraction

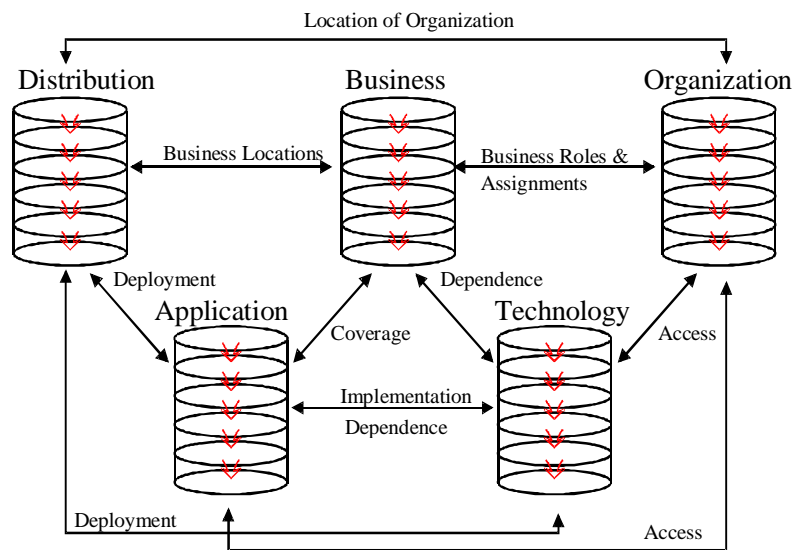
Another concept pivotal to OOBEE is the use of abstract thinking to identify common, reusable patterns and components in the business. Object-oriented software is touted for its ability to facilitate change. This flexibility comes from the consistent use of abstraction to identify general, reusable software components that can be easily extended to incorporate new functionality, and easily recombined to support new requirements.

The OOBEE Framework Solution – Dimensions

The isolation of business knowledge inside of silos makes it hard for businesses to identify and agree upon common business concepts and components. Coordination and communication across the enterprise becomes difficult, and the business cannot act as a unified whole. Enterprise-wide change is painful and slow because numerous organizational inter-dependencies must first be identified and differences resolved before the change can be implemented.

OBE is designed to specifically address these business challenges. As shown in Figure 2, OBE provides an organizing architectural framework that explicitly identifies several kinds of enterprise-wide concerns. The framework identifies five dimensions of enterprise knowledge: Business, Organization, Distribution, Technology and Application. Within each dimension, abstraction is employed to identify common, reusable concepts and components.

Figure 2 - OBE Framework Dimensions



A highly adaptable 21st Century enterprise must have the ability to readily reallocate work both internally and to external partners to rapidly respond to business opportunities. To do so, the business must have a common understanding of its core processes, value-adding roles, and products that is independent of who does the work, how it is done, and where those processes and results are executed. In the OBE framework, this essential business knowledge is isolated and captured in the “Business” dimension.

Similarly, knowledge about people, teams, organizations, reporting, control and social relationships is captured in the “Organization” dimension. A map between these two dimensions captures the responsibilities assigned to organizational elements for fulfilling specific business roles. Geographical and logistics knowledge is captured in the “Distribution” dimension, and mapped to the tenancy of business elements at specific locations. A similar mapping is defined for the tenancy of organizational elements. The fluidity of these mappings facilitates the redeployment of business and organizational elements to new locations to take into account changes in consumer and regulatory economics.

Knowledge about technologies used by a business along with the value-adding skills and capabilities of its people is captured in the “Technology” dimension. A map is maintained to track the dependency of business processes on technologies. Technology elements and components are specifically architected to allow the business to maintain its independence from specific technology vendors (see section below on abstraction and architecture), and rapidly evolve to take advantage of new technological advances. Technological skills are also mapped to organizational and distribution elements, easing planning for maintenance and training, as well as redeployment of knowledge workers to address new business opportunities.

Knowledge about standard ways the business applies technologies to meet its needs, along with relevant policies and procedures, is captured in the “Application” dimension. A map is maintained to track how well these applications cover specific business needs. Organizational skills and security access to these applications is also mapped, along with the deployment of applications at distribution elements. Once again this both eases maintenance and increases flexibility for application redeployment.

The OOBEE Framework Solution - Viewpoints

Each of the OOBEE framework dimensions is further sub-divided into six viewpoints: strategic, enterprise, operational, external design, internal design, and implementation. As shown in Figure 3 below, each viewpoint represents a clear stage of transforming an idea into an implemented reality within a specific dimension. The consistent use of these viewpoints to further separate business concerns enables a 21st Century enterprise to trace its initiatives from conception to deployment, track performance, establish its own best practices for future endeavors, and increase its agility.

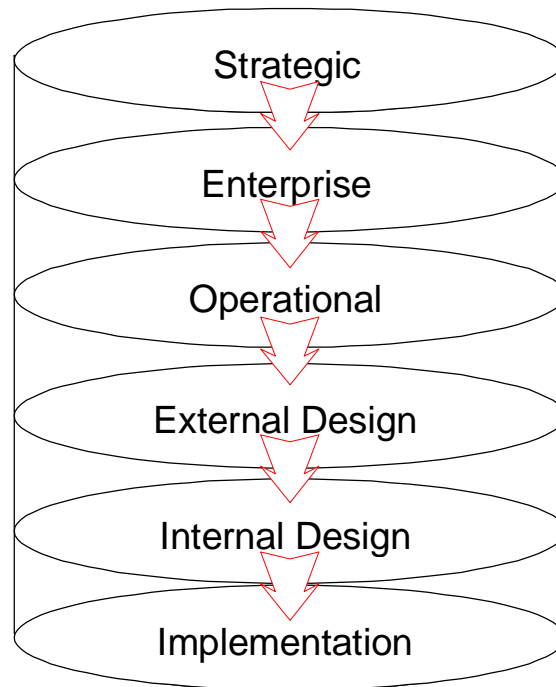


Figure 3 - OOBE Framework Viewpoints

- **The “Strategic” viewpoint** captures knowledge about visions, missions, goals, measurable objectives, strategies, opportunities and risks in a specific knowledge dimension. A map is supported for interrelating strategic intent between dimensions, such as the relationship between an enterprise wide objective and an organizational strategy. Similar mappings are supported to trace a strategy into the next level of action in a project or initiative. By defining and instrumenting critical performance measures, the business team is able to track the effectiveness of these initiatives (see the section below on Process and Tooling).
- **The “Enterprise” viewpoint** captures enterprise-wide initiatives, architectural standards, guidelines, rules, policies, and best practice patterns. When available as a resource to the entire business, this knowledge can greatly simplify and streamline the process of implementing strategies across the corporation. Of course, some of this knowledge may only be gained over time through experimentation and learning. Other knowledge may be available from external sources such as industry-wide standardization efforts.

- **The “Operational” viewpoint** is helpful as operations of the business are examined in light of strategic initiatives. Knowledge from the “Enterprise” viewpoint is refined, extended and captured in the Operational viewpoint. This can include knowledge about working or desired business processes (across functions and the supply chain), supporting concepts and workflows, as well as mappings to organizational units, projects and corporate initiatives. When shared across the business team, this knowledge facilitates discussion about change initiatives and provides a foundation for training new operational team members. By taking care in knowledge gathering and representation, it is possible to directly implement many of the “Operational” viewpoint components. When this is done, resulting business processes become easier to understand and change.
- **The “External” viewpoint** captures knowledge on interfaces between the business and its customers, partners, suppliers, and vendors. External influences can include government regulations as well as industry-wide standardization efforts. Each of these business participants may have a different way of interpreting and representing events and information than that developed in the “Enterprise” and “Operational” viewpoints. The use of clearly defined external interfaces makes it easier for the business to communicate with its participants and accommodate internal change without impacting its business participants. The business can also more readily change its partners, suppliers and vendors. Mappings and translations to changing external representations can be more easily accommodated to insure that everyone remains in sync and communication flows smoothly.
- **The “Internal” viewpoint** captures knowledge about the design of business components, including internal structures and methods, tradeoffs, and decisions. This can include mappings to existing business systems and other components unchanged by current strategic initiatives. Once again, keeping this knowledge separate and isolated allows it to more readily evolve (e.g. to incorporate process improvements or new technologies) without impacting the rest of the business.
- **The “Implementation” viewpoint** contains knowledge about the actual implementation of business component designs, including design refinements, detailed automated or manual procedures, quality assurance, deployment, and operational performance measurements. The isolation of implementation issues allows effective feedback on the quality and completeness of designs, while facilitating the incremental deployment of new components. In fact, the entire viewpoint approach supports incremental evolution of the business with fluid, effective and rapid feedback between the viewpoints.

The OOBЕ Process and Support Tooling

OOBE is really a process for facilitating business change in all of the areas of the architectural framework. Since applying and maintaining such a broad organizing framework across an enterprise can be a daunting endeavor, OEI has developed and continues to evolve a process and a set of tools to help make this task tractable. This section describes the OOBЕ process and the tools OEI uses to support the process.

One essential tool used throughout the process is an object-oriented enterprise knowledge repository. Team members use this repository, organized around the architectural framework, to capture, abstract, share, evolve and reuse business knowledge and design components developed in each step of the process. Whenever possible, knowledge communication and collaboration are done automatically from this repository using the company's intra-net and e-mail services. As the process moves forward, the shared repository grows richer, eventually becoming a key 21st Century business asset.

The OOBЕ process consists of three essential steps:

1. Develop a compelling vision of the future enterprise – *where you want to be*
2. Develop a realistic understanding of the present enterprise – *where you are now*
3. Engage and support the enterprise in transforming itself – *forge a path to get there*

Though the first two steps can be done in either order, it is often helpful to first establish a solid strategic vision of the future so that examining and tackling present operational realities does not become too depressing for business team members.

Envisioning the Future

One good way to start capturing this future vision is by conducting a series of interviews with the company's executive leadership. Leaders are asked to articulate their vision of the future enterprise, layout their main goals and objectives for realizing that vision, highlight challenges they see now facing the organization, and discuss the initiatives already underway for addressing those challenges and meeting those objectives. This vision should cross and incorporate all key areas of the enterprise. The results of the interviews can be documented and published through the knowledge repository.

Future visions do not become real for the business team unless they feel ownership in that vision and future. One of the best ways we have found for securing that ownership is to conduct a large scale event during which the executive vision is presented to a majority of business team members, and the membership is thoroughly engaged to ratify, evolve and design their own future. Supporting presentations from industry experts can be added as appropriate. Participants are specifically organized into teams that maximize the cross-functional fertilization of ideas and viewpoints.

This is typically conducted as a three-day off-site event that involves extensive coordination and planning so that everyone's time and energies are constructively employed. Behind the scenes of the event, an architectural support team captures and documents the strategic, enterprise and operational business and technology knowledge that emerges. This can include strategic diagrams, models of proposed future business processes, workflows, roles and new business ideas, as well as clear, shared definitions of fundamental business concepts. This knowledge is shared with the business team as part of the event, and is also made available after the event through the knowledge repository, helping to promote on-going team reflection and engagement.

Obviously, the event is just a start towards creating the enterprise's future. Yet since this future will be shared and owned by stakeholders across the business, they will be more willing to commit to commit their time and energy to future brainstorming and design sessions. Personal connections will have been made to foster the on-going participation of interested and experienced team members from across the enterprise. After the event, members of the architecture team will be well prepared to participate in and document the results of on-going business and technology design sessions. Their evolving knowledge of effective, reusable business and technology patterns will add significant value to these design sessions.

Understanding Current Enterprise Realities and Overcoming Barriers to Change

The event also affords a tremendous opportunity to gain a solid, shared understanding of how the business really works. A session can be conducted during which members of functional areas first gain consensus about and then share their workflow. This can be followed by a session during which participants across the enterprise present recommendations on positive changes to that workflow that may facilitate flow in other business areas. These sessions can help the business squarely face and swiftly alleviate long-standing organizational barriers and misunderstandings.

Once again, a behind the scenes architectural support team captures and documents the enterprise and operational knowledge that emerges, sharing it with participants and publishing it through the knowledge repository. The architecture team can use the event as an opportunity to make a number of assessments about the current business, its culture, and its readiness to change. They can also begin to assess technological factors that will influence this readiness, such as hardware, software, networks, other infrastructure, staff skills, vendor relationships, management, maintenance and design practices, etc. This information can be fully flushed out in interviews and knowledge gathering sessions after the event, but the event helps the team identify and forge relationships with reliable sources of practical business and technology knowledge.

Transforming the Enterprise

The final sessions of the event provide an opportunity for participants to develop action plans for implementing their newly designed business. Though the event provides a wonderful forum for initiating change, the transformation of the business will require concerted attention on an on-going basis. During the final sessions, follow-up teams are formed and staffed for this purpose, tasks and schedules planned, and deliverables and performance criteria established.

Behind-the-scenes work by the architectural support team will insure that these follow-up teams and plans are captured in the knowledge repository, and that the entire repository is available to all business team members when they arrive back at their work places after the event. The support team can either disperse to join follow-up teams and be available to continually evolve the repository, or team members can be trained in updating this knowledge themselves. Performance-monitoring capabilities can also be added to the repository so that follow-up teams and executive leaders can accurately measure progress towards achieving the future vision.

As the new business and technology designs begin to take shape and move closer to implementation, the key OOBE principles of separation of concerns and abstraction will have been firmly communicated and reinforced through interaction with the architecture team and the knowledge repository. The architectural team can intervene if necessary to bring things back on track, but the design of the future business will definitely be oriented towards a well architected and engineered 21st Century enterprise.

OOBE Software Design Techniques

When support of a new or existing business process requires the design and development of software, OOBE once again emphasizes its core principles of abstraction and separation of concerns, and its object-oriented foundation. Business knowledge of the process and supporting concepts can be modeled as business objects, taking advantage of abstraction and reuse opportunities. Depending on the nature of the business system being designed, these may exist in the resulting system as actual software components.

OOBE identifies three main types of business objects – process business objects, entity business objects, and event business objects. Process business objects and event business objects are created on business process diagrams when modeling business processes. Entity business objects are created on object relationship diagrams when modeling business information. State issues of any of these objects can be addressed in object state diagrams.

The way these objects are implemented in software typically depends upon other constraints or requirements of the technology and application architectures. For example,

if a suitable business object framework (BOF) is available, the framework may provide direct support for these higher-level business objects and less implementation work may be required. These objects can also be directly implemented as distributed objects using a suitable object distribution vehicle such as Java RMI, or a CORBA or DCOM compliant ORB.

Process Business Objects

A process business object represents either the persistent state of a process or that of a step within a process. Since the work contained in a business process may take a long time to complete, the process business object provides a conveniently place to save information only needed during the lifetime of a process. It can also provide a facility for tracking the overall performance of the business in carrying out the process. Persistent process business objects can also be used to introduce process notions into a stovepipe-oriented set of legacy systems. They can represent the glue for a business process and carry process state while communicating with non-integrated systems built for individual functional areas.

Process business objects are treated as services of another business object, typically an organizational unit or business role (see discussion of entity business objects). As such, process business objects can have a complete interface specification including arguments defining the information they exchange. They can also be constrained by pre-condition, post-condition or invariant constraints.

The behavior represented by a process business object is often further described using a business workflow diagram. This kind of diagram shows steps and decisions that take place within the process and roles responsible for carrying out those steps and decisions. Control flow between steps in the process is also defined. If workflow automation is an important element of the business system, these workflow descriptions can be automatically translated into code to drive a workflow engine, or other objects that perform relevant notification and flow of control services.

The flow of control between process steps and decisions can be further refined using a service request specification. These can be used to specify the source of control and process knowledge passed, and can be used to further drive the automatic generation of code to automate the process.

Event Business Objects

An event business object is used within a business process to indicate a significant change in the state of the business that occurs within the process. This state change will typically require notification of business team members other than those responsible for the current business process. Event business objects can also carry state knowledge or other relevant information, such as when the event occurred, who participated in the event, etc. Persistent event business objects can therefore also be used for process performance monitoring and measurements.

The approach used to automate an event business object depends upon the available or chosen system architecture. For example, event business objects can communicate using publish and subscribe mechanisms inherent in distributed object support environments, connect with a workflow engine, trigger e-mail notifications, or simply record their state in a database and use its triggering mechanisms to initiate appropriate responses.

Entity Business Objects

Entity business objects represent knowledge about people, places, or things that are important to the business. Typically, the knowledge modeled in entity business objects will have long-term importance to the business, and will be persisted in some form of database. Entity business objects can represent knowledge in attributes, and can also have persistent relationships with other business objects.

To represent how people participate in the business OOBE supports a type of entity business object called a “Party”. A number of party sub-types are supported including “Organization Unit”, “Business Role”, “Team” and “Individual Person”. Organization Units, Business Roles and Teams can participate in business processes as the party responsible for any given process or process step. People can play multiple business roles and participate in many organization units or teams.

When used to integrate a diverse set of disconnected legacy systems, business object servers can be automatically generated from entity business objects, and wrapper methods developed to access and store the appropriate entity knowledge. If the entity business object represents new knowledge or a system is being replaced, an appropriate database structure can be automatically generated from the entity business object.

Supporting Objects and Other Techniques

Other objects can be designed in the technology and application dimensions of the OOBE framework, and smoothly integrated with the business objects in an overall system. One effective way of doing this is through the distributed, component-oriented services of an ORB, BOF or Enterprise Java Beans environment.

By emphasizing well-designed component interfaces over the specific technique used for internal component design, the OOBE approach encourages the incorporation of third party or other external components. This emphasis also allows OOBE to blend well with other object-oriented, life-cycle methodologies that focus on software development, testing, integration, deployment and maintenance. OOBE designs can feed into these life cycles as configured elements and continue through to deployment.

Sample OOBEE Deliverables

Deliverables within the OOBEE process are often produced and maintained entirely within the shared knowledge repository. Using the client's intranet, the materials are made accessible to all authorized business team members. Some of this knowledge is represented visually in the form of diagrams. Other elements are captured in forms and presented as associated textual knowledge. An active attempt is made to organize the intra-net so that knowledge appropriate to specific business audiences or organizational roles is easy and intuitive to access and browse.

The figures below show each main type of diagram used within OOBEE as snippets of sample deliverables. The related non-visual knowledge is not shown. OOBEE is actually notation-neutral. For example, an object relationship diagram could be presented in IDEF notation, UML, or with some other suitable visual language. The notations shown in these sample diagrams are the ones OEI will use in its engagements unless the client follows other standards for these types of diagram.

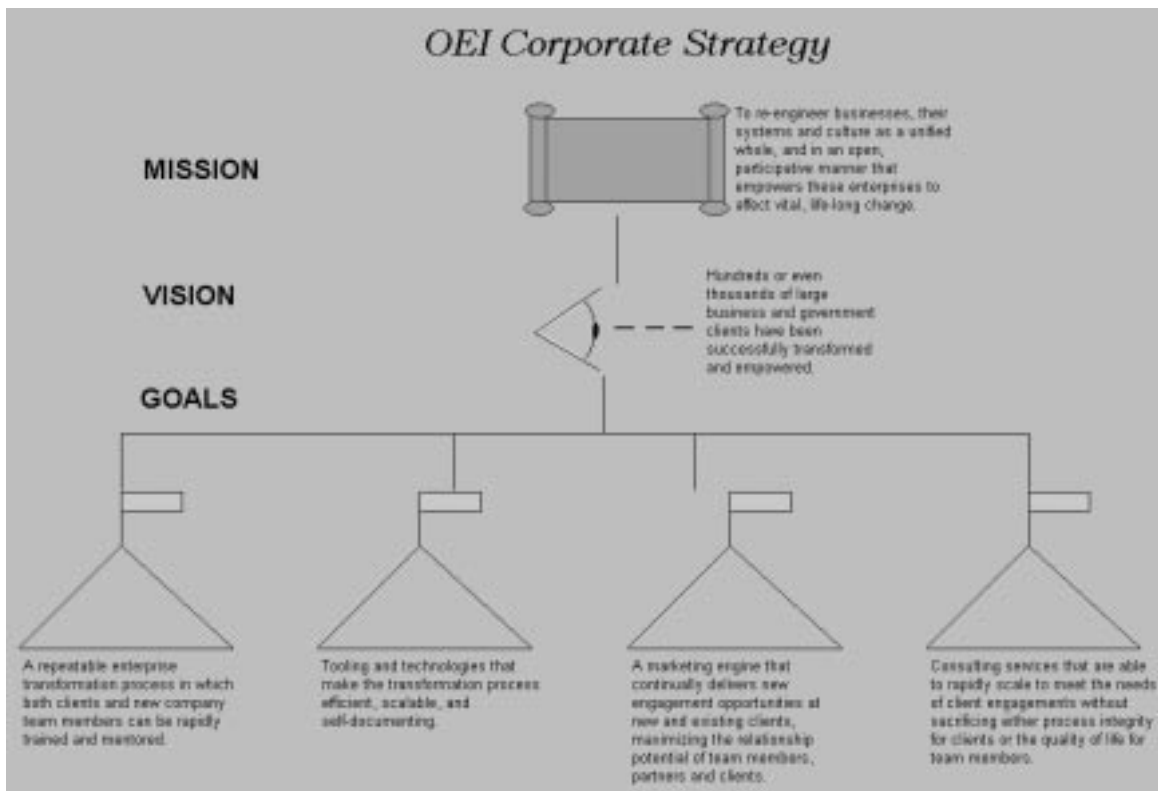


Figure 4 - A Sample Business Strategy Diagram

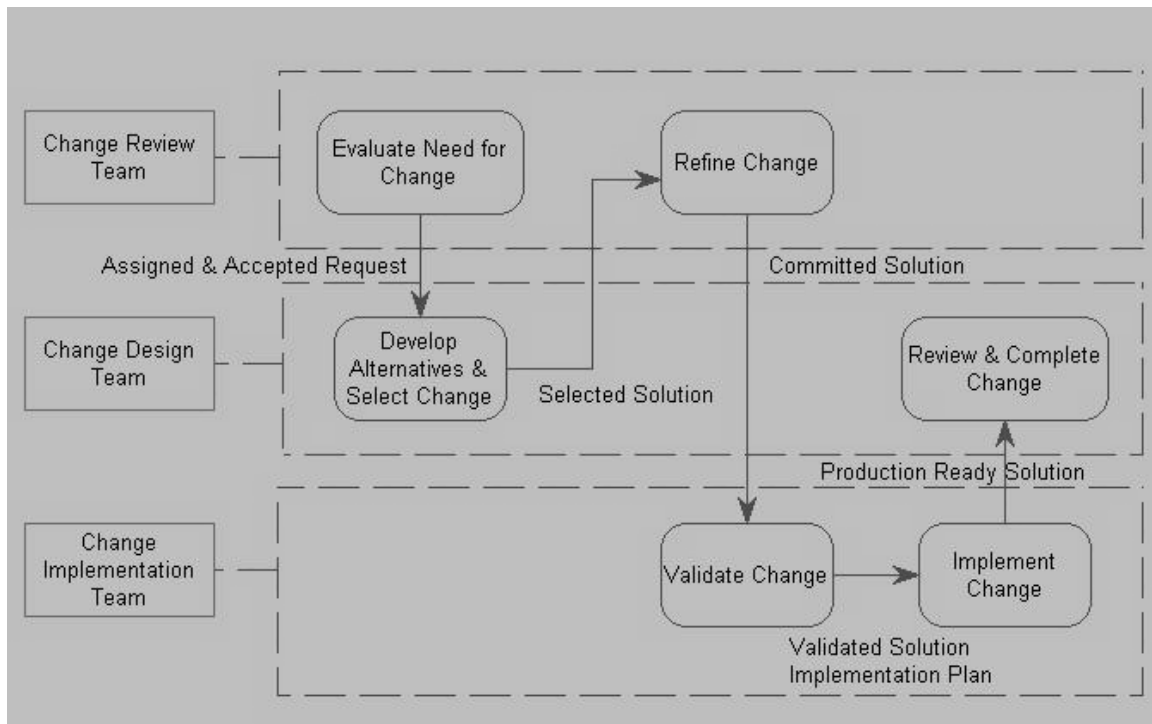


Figure 5 - A Sample Business Process Diagram

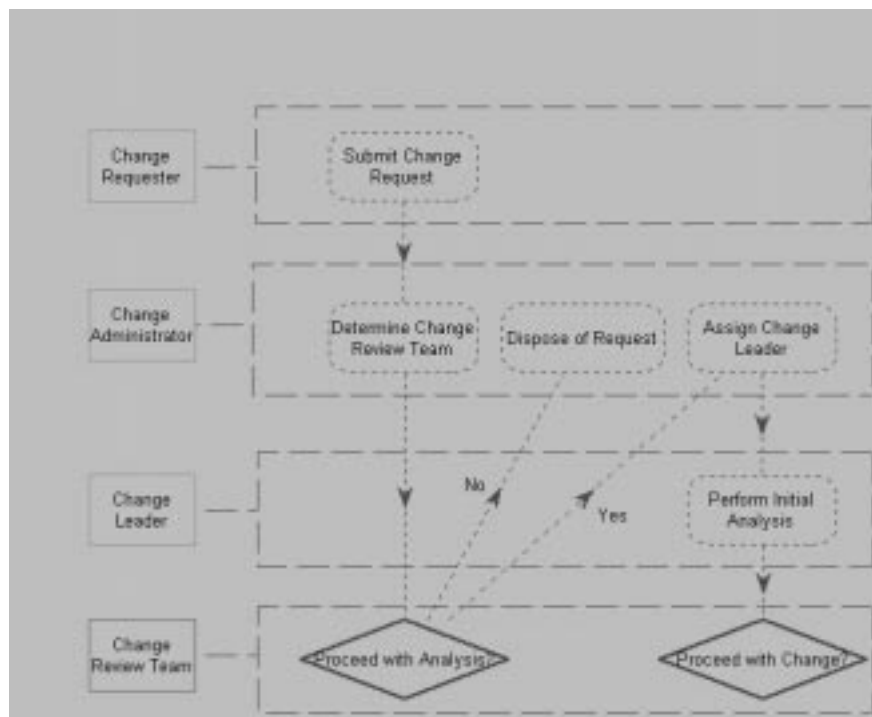


Figure 6 - A Sample Business Workflow Diagram

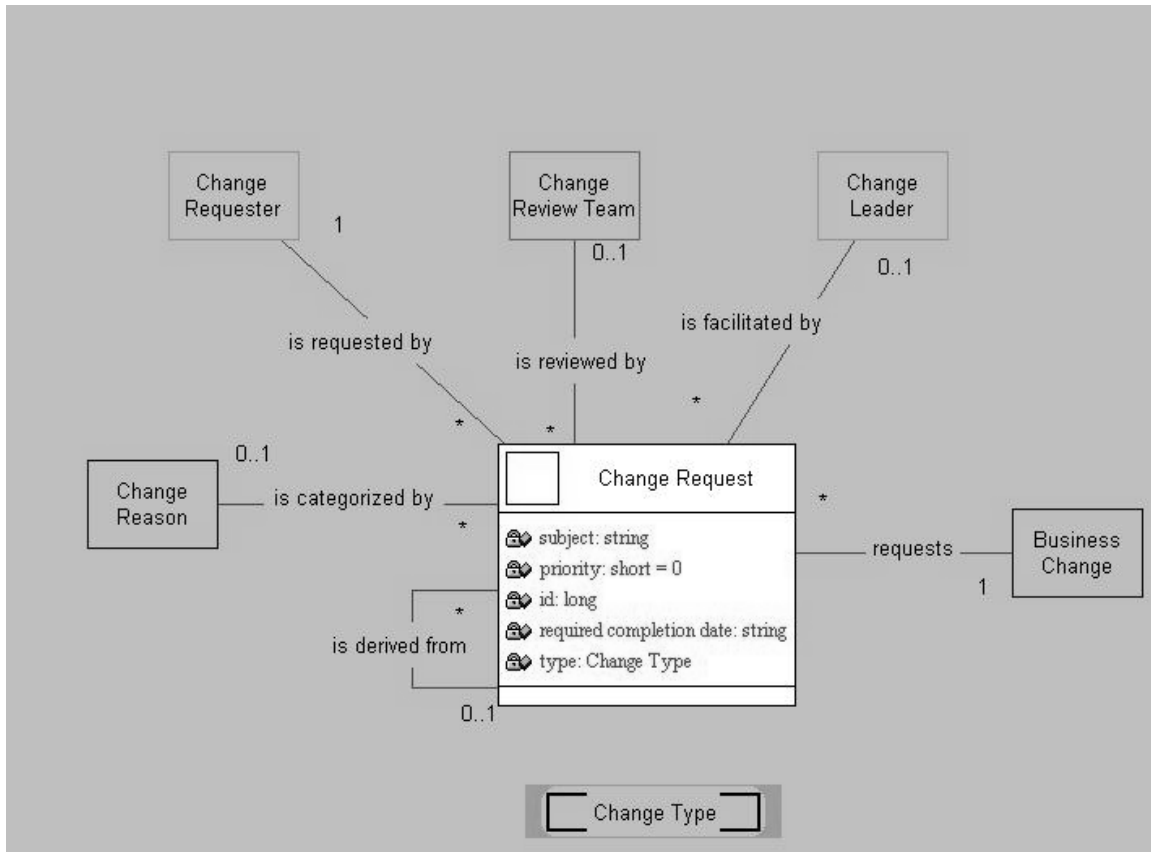


Figure 7 - A Sample Object Relationship Diagram



Figure 8 - A Sample Organization Diagram

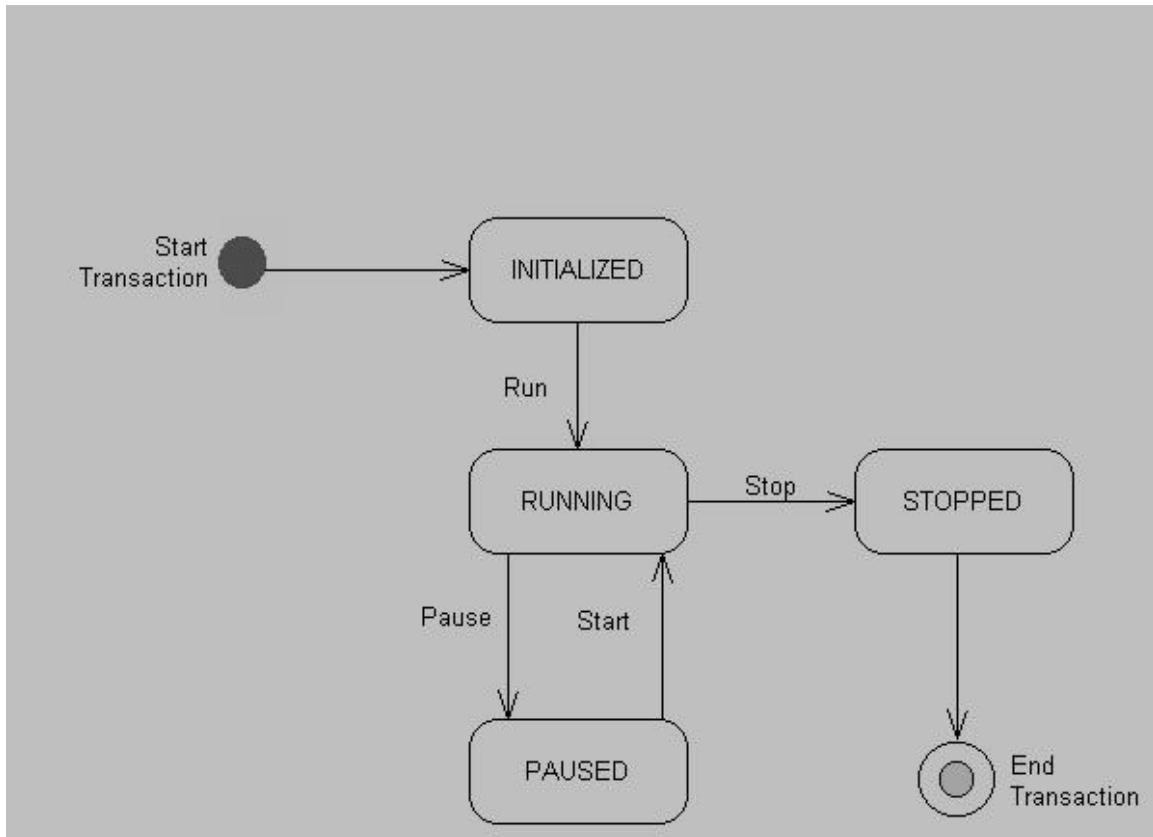


Figure 9 - A Sample Object State Diagram

Open Engineering — OOBЕ Consulting

Open Engineering Inc., (OEI), maintains a core staff of business and technology consultants who are all highly skilled in the Object-Oriented Business Engineering™ process. In addition, OEI has active partnerships with a number of firms whose skills include:

- management consulting and organizational change
- knowledge management and strategic performance monitoring technologies
- business object framework technologies
- distributed object environments.

Furthermore, OEI is a long-term active participant in industry standards organizations, including the Object Management Group (OMG).

When supporting an OOBЕ engagement, OEI draws upon specialized resources to create a seamless team with the right mix of skills to meet a client's needs. Business and systems architects, object/process/data modelers, component engineers, and project managers often drive the early stages of an architecture, reengineering, knowledge management, or enterprise application integration project. Consultants additionally provide training and mentoring to increase the skills of a client's team. Later in the project, the client's staff may take over and drive the process entirely, drawing upon OEI's assistance only as necessary to overcome bottlenecks.

Envisioning the Future

To help a client design and conduct a future vision event, OEI works with its management consulting partners to obtain facilitators with extensive experience in high energy, cross-corporate "cultural" events, which require careful planning and coordination. Strategic planners with specific skills in assisting businesses create participative and dynamic business visions and strategies.

Knowledge Repository

As previously mentioned, a Knowledge Repository plays a pivotal role in the OOBЕ process. OEI has extensive experience using the Ptech FrameWork repository for these purposes, and has developed a set of extensions to that product specifically in support of OOBЕ. Because of FrameWork's open architecture and extensibility capabilities, OEI has been able to meet a wide variety of client knowledge publishing and automatic code generation requirements, as well as interfacing with and populating corporate information system repositories such as the Platinum repository. OEI has a long-standing relationship with Ptech's development organization and actively participates in their product planning activities. OEI can draw upon Ptech's consulting organization as needed to meet a client's unique tool interfacing requirements.

Strategic Analysis and Performance Measurement

A client's executive leadership may find it helpful to maintain an active view of very specific strategic knowledge to help in planning, analysis of strategic options, and tracking the performance of strategic initiatives. The Enterprise Strategist software from

OEI partner Enterprise Software Inc., provides a powerful and unique environment to enhance strategic business thinking and measure strategic performance. OEI can populate the Enterprise Strategist repository from Ptech FrameWork, and allow executives to use its rich analytical capabilities. Enterprise Strategist's performance measurement capabilities can be readily integrated with OOBE business objects to track strategic and operational business performance.

Business Object Patterns

In our extensive years of client experience across numerous industries, the OEI team has developed a number of generalized business object patterns that represent common business process and entity issues found in many industries. These patterns can be:

- inserted into the enterprise or operational dimensions in a client's OOBE modeling efforts
- used to speed the process of OO analysis and design
- helpful when attempting to harmonize multiple viewpoints across a compartmentalized organization, (i.e., to integrate the different viewpoints of a supply chain team).

Business Object Frameworks

A client system may be designed to take advantage of the common business object services provided by a BOF, augmenting the services of the distributed object environment and thereby reducing the work required to implement their business objects. BOF products are relatively new to the software industry and their providers are for the most part dynamic, young companies. OEI has used all three of the main BOF products currently on the market and has partnering relationships with their providers: BOMA from SES Software Holdings, Assembly Line Basic from InLine Software, and the BOCA Product from Data Access Technologies. In addition, standardization efforts are well under way for a business object component specification language called CDL that can be used to interface with BOFs. OEI has developed the ability to automatically generate CDL specifications from OOBE business objects stored in a Ptech FrameWork repository.

Distributed Object Architecture and Design

OEI has extensive full life-cycle experience with architecting, designing, implementing and deploying large scale distributed object systems. This includes common components of these systems such as ORBs, object-oriented, hybrid and relational database management systems, as well as object software development and life cycle tools. OEI consultants can augment a client's technology architecture efforts, assist with reviewing and assessing the legacy environment, and help define technical requirements for a new, distributed object system. OEI has partnerships with several component design firms if it is necessary to augment client staff with highly experienced, distributed object designers.

Data Integration

Often in the midst of an OOBE engagement, it becomes clear that different areas of the business have fundamentally different ideas about pivotal business concepts. This may manifest in radically different database structures in silo-based information systems.

Frequently these issues arise to hinder the ability of the business to make sense out of the information deposited into a data warehouse. In order for the business to act as an integrated whole, these issues need to be addressed. The problems tend to go way beyond just data quality, and are readily resolved by applying the OOB framework and process to the business as a whole. OEI has extensive experience with data warehouses, data marts, and the steps necessary to achieve data integrity. An OOB team can be augmented with specialists who can directly address and resolve these complex issues.

Additional Reference Materials

In addition to the white papers and materials available on the OEI web site, www.openeng.com, and partner web sites, a number of resources may be reviewed to gain additional insight into the subjects presented in this white paper. A few sources of additional material are listed below.

Future Vision Events

- “Real Time Strategic Change”, Robert W. Jacobs, Berrett-Koehler, 1997
- “Large Group Interventions”, Barbara Bunker and Billie Alban, Jossey-Bass, 1997
- “Open Space Technology”, Harrison Owen, Abbott Press, 1993

Knowledge Management

- “Value-Based Knowledge Management”, KPMG Peat Marwick, Addison Wesley, 1998
- *Knowledge Management Magazine*, CurtCo Freedom Group, Malibu, CA
- Ptech Inc., www.ptechinc.com

Business Object Frameworks

- Object Management Group, www.omg.org, Business Object Initiative, Business Object Component Architecture efforts
- OPEN Group, Enterprise Components Coalition
- Data Access Technologies, www.dataaccess.com/dat
- InLine Software, www.inline-software.com
- SES Software Holdings, www.sesh.com