



Strategic White Paper

Better Alignment of IT With Business

The Ontology-Based Approach

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Jenz & Partner was founded in 1985. Dieter E. Jenz serves as the company's president. The company provides a range of industry analyst, business and technical consulting, and educational services. It is widely known for its contributions to distributed applications, object-oriented development, and relational database technology. For additional information, Jenz & Partners' Website URL is www.jenzundpartner.de.

Jenz & Partner has developed a business process ontology, which can be made available to clients in the context of consulting engagements. Jenz & Partner provides training in ontology definition and in software development process optimization in general.

This White Paper focuses on human-oriented business process (workflow) aspects, which primarily execute within the organization boundaries, and are thus usually referred to as private business processes. It leaves so-called public business processes aside, which support the collaboration of business partners across enterprise boundaries.

The Protégé-2000 ontology and knowledge base editor has been used for the definition of the Jenz & Partner business process ontology. Protégé-2000 was developed by Stanford Medical Informatics at the Stanford University School of Medicine with support from various agencies.

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Executive Summary

Organizations are looking for means to keep track with an ever faster changing business environment. To gain an edge over the competition, organizations must find ways to change business processes faster. In most organizations, this involves changes at two levels, the business level and the IT level.

Business process flow logic is often buried in program code, making the change of process flow a laborious task. In a similar fashion, business rules are also represented in program code. Limited IT resources often result in delays, which may even compromise an organization's competitiveness. Not surprisingly, today, IT is often considered more as a part of the problem rather than as a solution.

This White Paper introduces an ontology-based approach to better align IT with business. The Business Process Management Ontology (BPMO) empowers business analysts and organization experts to drive better alignment of IT with business forward.

Better Alignment of IT With Business – Still an Issue

Business managers have been requesting better alignment of IT with business for years. Many software vendors have pledged to meet this request over the recent past. However, actual results of alignment initiatives have been disappointing in most organizations. The reasons are manifold. Probably, for most organizations, the top-three reasons are:

- Business experts and IT experts do not understand each other well. Both groups seem to “speak different languages”, using different vocabularies. It would not be just to put the blame solely on IT. Very often, different organization units are using different terms to mean the same thing, and the same term to mean different things. Such issues may go unnoticed, if an IT expert, such as a software engineer, is not versed in business management, which is usually not the case.
- IT experts define representations of things active in business domains. This is done by abstracting real-world things and concepts. Hence, such a representation reflects a reification of some abstraction that is important in the respective business domain. Basically, there is nothing wrong with this approach. However, there is a danger that business and IT lose synchronization. Rather than IT experts, business experts should be able to describe real-world things and concepts using their terminology. That kind of business semantic layer is generally missing in most organizations.
- Business process flow logic and business rules are often buried in application code. As a consequence, changing business processes is time-consuming and labor-intensive. A business may even lose its competitiveness if it is not able to quickly react to changing business needs.

Business experts often use sophisticated tools to help with describing the business, such as business modeling tools, business process modeling tools, and so on. Unfortunately, tools are generally based on proprietary information models, which inhibits semantic interoperability. Loss of information during information transfer among tools has been an unsolved issue for years.

To better align IT with business, the “understanding gap” between business and IT must be eliminated. An ontology provides a powerful solution to this need, in that it provides the long-needed business semantic layer. As such, an ontology bridges both worlds, the business world and the IT world, making it possible to establish traceability. In addition, it will be much easier to determine the effects, if something changes at the business level. Overall, an ontology provides a close link between two distinct units within an organization: Business management and the organization department on one side, and the IT department on the other side.

The Business Process Management Ontology allows business experts to describe things and concepts, and relationships among them, at three levels:

- Describing the business;
- Describing business processes;
- Describing applications.

Describing the Business

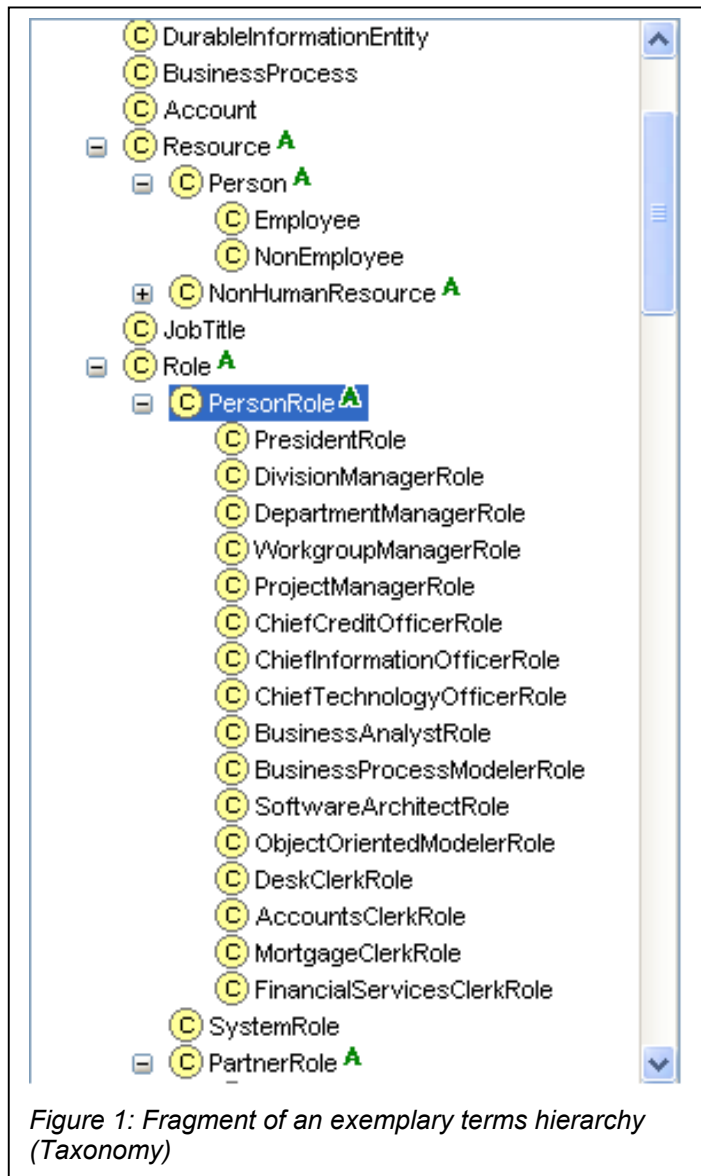
The business semantic layer requires the definition of a common vocabulary. Normally, one or more business analysts or organization experts would perform this task. As experience shows, it may take numerous meetings with business experts from various departments and a long time until a consensus is reached.

As a first step, describing the business requires identification of real-world things and concepts. A business analyst or organization expert would go through available documents, such as the enterprise's internal organization manuals, and extract information. Then, if necessary, real-world things and concepts would be checked for semantic meaning, which may result in finding synonyms and homonyms. In a simplified view, the identification of relationships results in hierarchical relationships (i.e. a taxonomy), as well as non-hierarchical relationships (i.e. relationships across hierarchical paths). Almost naturally, the final result will be an ontology, which describes the structural aspects of the business.

The ontology would include definitions of a multitude of real-world things and concepts, such as:

- Resources (human resources (persons) and non-human resources (assets));
- Organization units;
- Roles;
- Role competencies;
- Privileges;
- Tasks;
- Business documents;
- Durable information entities.

This is a purely business-oriented view, without any mention of IT aspects, let alone implementation details. The business analyst or organization expert would be the suitable role to describe the structural aspects of the business in the ontology. It would even be counter-productive to view business aspects through the eyes of a software engineer.



The above figure shows a fragment of the terms hierarchy. Each term represents a class. Classes are organized into a

hierarchical taxonomy. There are many similarities with object-oriented design. For example, in object-oriented design, the concept of generalization is based on taxonomical relationships (also called “is-a”).

While a taxonomy is one of the foundations of an ontology, it is also possible to define relationships between classes. Again, there are many similarities with object-oriented design.

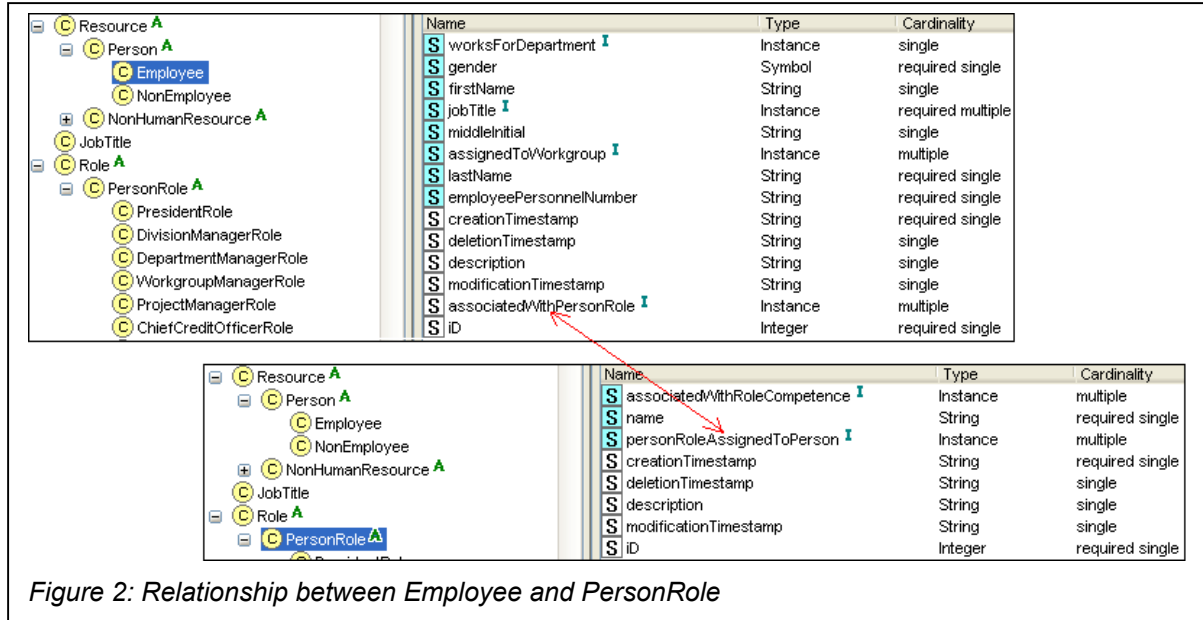


Figure 2: Relationship between Employee and PersonRole

The above figure shows the relationship between the class “Employee” and the class “PersonRole”. The property “associatedWithPersonRole” is inherited from the super class (“Person”), which is why the property icon has a white box.

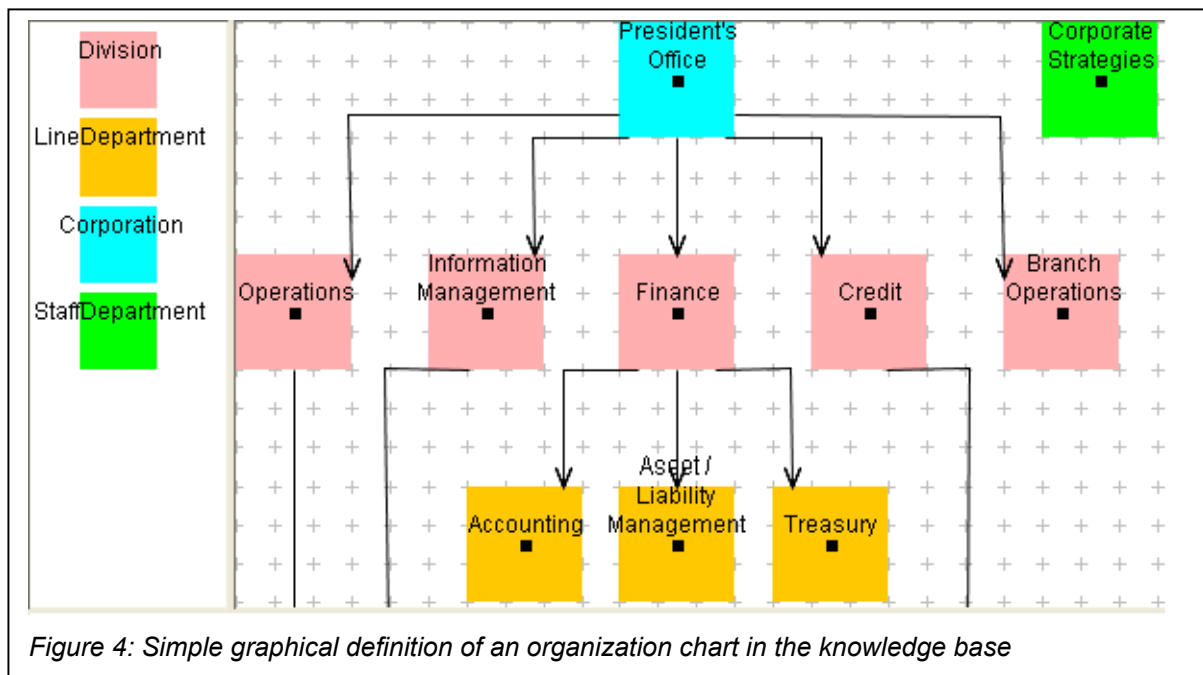
An ontology can be loosely compared to a relational database schema, which is the organization or structure for a database. A relational database does not contain any user data after a database schema has been defined. Likewise, an ontology contains no user data. The instantiation of an ontology, that is when information is entered and stored, results in the creation of a knowledge base. Like a populated relational database, a knowledge base contains structure and data. However, unlike in the database field, where one would talk about “empty” or “populated” databases, in the ontology domain there are two different terms to distinguish between the “empty” (ontology) and “populated” (knowledge base) states.

To validate ontology design, a business analyst or some other business expert would create at least a few instances (a.k.a. records) in the knowledge base, which can be done with the help of a knowledge base editor (a.k.a. knowledge acquisition tool).

It would not be wise to duplicate information that is already stored in corporate databases. However, it may be reasonable in some cases to declare the knowledge base the primary data store, which is then replicated in one or more of the organization’s databases. For example, a business expert may choose to maintain the organization’s organizational structure information in the knowledge base.

Figure 3: Using a simple data entry form for capturing employee information

A knowledge base editor may provide purpose-specific widgets for graphically visualizing relationships between instances. For example, an organization chart can be created from information in the knowledge base.



It may be argued that describing the structural business aspects is an unnecessary step. However, a second look reveals its justification. In many organizations, such descriptions are scattered over multiple documents, and are often in some unstructured format, meaning that descriptions cannot be machine-interpreted. In contrast, an ontology represents machine-interpretable semantics.

Describing Business Processes

Once the semantic foundation has been laid, private and public business processes can be described, effectively based on the description of static business aspects. Here, we see business aspects and technical aspects coming together.

Better alignment of IT with business demands easily changeable process definitions. As a consequence, burying process flow logic in application code would be a bad idea. Clearly, the business analyst should be able to alter process flows when the need arises. Likewise, business rules must be changeable without having to resort to software developers for modification of program code.

Process tasks, on the other hand, are associated with applications, which implement them. Applications are developed based on object-oriented design models. However, there is a clear separation of concern. In order to invoke an application and communicate with it, the business process engine (a.k.a. workflow engine) only needs to know the application's interface and what protocol to use for interaction. There is no need for the business process engine to know about implementation details of an application.

Overall, the business analyst assumes the lion's share in terms of responsibility for business process definition and management. IT is only involved to some small extent, namely providing application interface definitions, and identifying parameters needed for communication between business process engine and invoked applications.

The Business Process Management Ontology supports the definition of private and public business processes. In addition, it provides the coherent environment needed to progress from process definitions to executable applications. Business requirements are transformed into software systems without loss of information.

In the effort to achieve maximum reuse of business process definitions, the "Process Task Context Type" concept has been defined in the ontology. A Process Task Context Type

provides a semantically rich description of a process task. It is reusable in that it can be referenced in multiple private business processes, which meets an important requirement. A Process Task Context Type defines the role that performs the task, as well

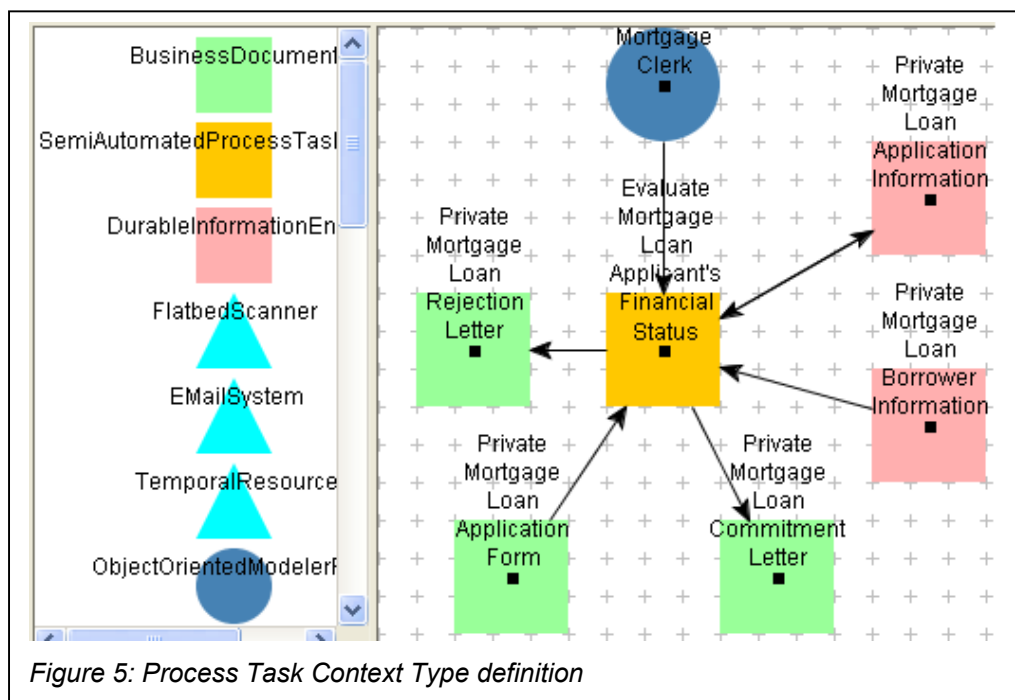


Figure 5: Process Task Context Type definition

as business documents and durable information entities. Both business documents and

durable information entities may be consumed, created or updated. Relationships between process task and business documents and/or durable information entities indicate whether information is read, written or updated.

Process task context type definition and business process definition are not separate activities. After having started with business process definition, the business analyst will define process task context types as needed. Whenever there is no Process Task Context Type definition, the business analyst would define one. Over time, the number of Process Task Context Type definitions will grow, and the potential for reuse will also increase.

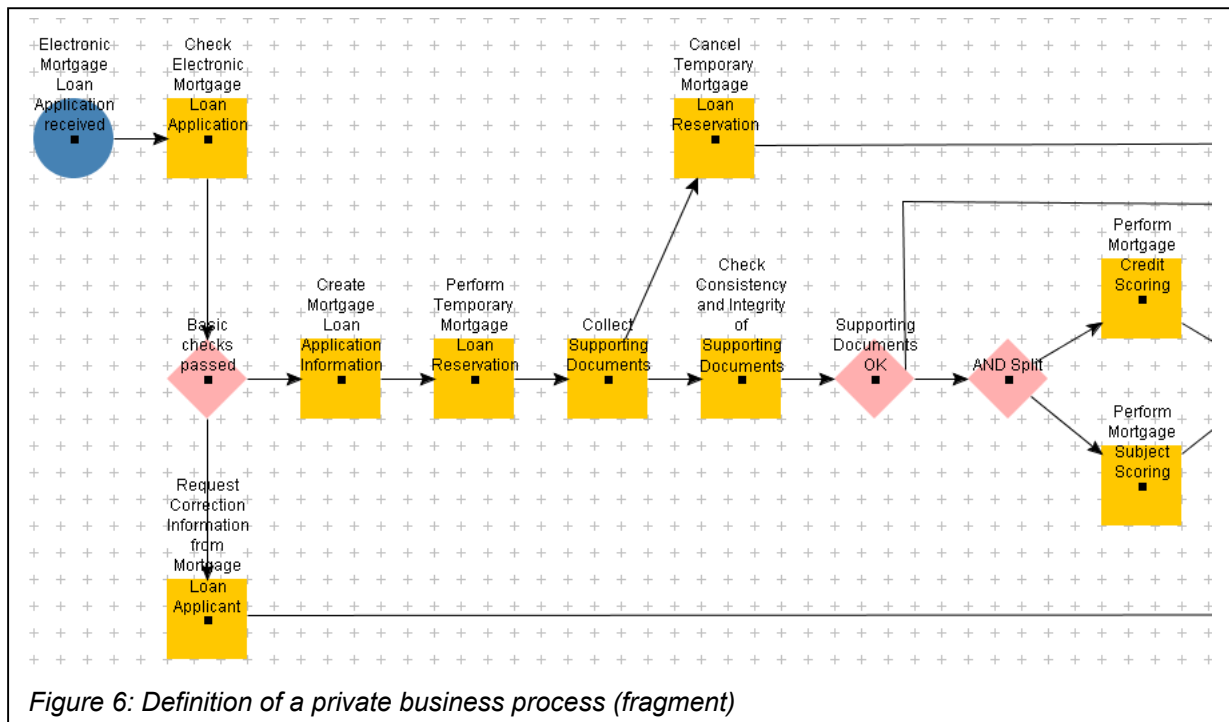


Figure 6: Definition of a private business process (fragment)

The Business Process Management Ontology supports the Business Process Modeling Notation (BPMN), an emerging vendor-neutral standard. BPMN is an expressive notation, which currently supports private business processes. For the definition of public business processes, the Business Process Management Ontology relies on the ebXML Business Process Specification Schema (BPSS) specification.

Supporting adequate public standards prevents vendor lock-in in that it does not tie business process definitions to a particular Business Process Management System (BPMS). BPMS-specific process definitions can be generated by a generator program or script, and subsequently deployed in a business process execution engine for execution.

The definition of business processes primarily involves business analysts. However, process tasks are linked to applications, which implement process tasks. Therefore, a software engineer would need to make sure that applications can be invoked by the business process engine. However, business analyst and software engineer will interfere with each other, meaning that the business analyst is not in danger of inadvertently undoing the software engineer's work and vice versa.

Describing Applications

Business process definitions are executable when deployed in a business process engine. While the static process flow defines the order of task execution, each task is associated with an application that implements it.

The specification of task implementation details is normally not a responsibility of the business analyst. Usually, software engineers apply object-oriented analysis and design techniques to define class models in Unified Modeling Language (UML) syntax. Software tools can then generate source code from class models. Clearly, object-oriented analysis and design is popular among software engineers and code generation quality has greatly improved over the past years. However, UML has suffered from a lack of semantic precision, which is to be remedied to a large extent only with UML Version 2.0.

As an alternative, task implementation details can be defined in the ontology. Semi-automated tasks are event-driven, which makes it possible to decompose a task into a number of task interactions. A task interaction is initiated when the event that it is associated with, is raised. A task interaction is also associated with an action, which represents an operation.

Figure 7: Task Interaction definition (Event-Action-Event task interaction type)

While business analysts are usually not familiar with object-oriented analysis and design techniques, an ontology-based task definition approach definitely suits them better. The ontology provides mappings between business entities (the business analyst's vocabulary of concepts) and business objects (object-oriented representations of business entities). In an

object-oriented design environment, such mappings do not exist, since UML is ignorant about business entities, and, as a consequence, object-oriented design tools generally do not support the definition of business entities.

When defining an ontology, one would first devote some time to devise a taxonomy, which structures the ontology hierarchically. An ontologist tends to represent the real world without thinking about optimization. For example, there are multiple roles that a person can play (e.g. division manager, department manager, workgroup manager, business analyst, etc.). Therefore, it is natural to define one class per role. A software engineer, on the other hand, tends to consider optimization from the very beginning. Object-oriented design is often, and should be, guided by design patterns. For example, an object-oriented modeler might want to define one class to represent roles, and another class to represent role types. In the ontology, it is not necessary to define a role type concept, since the taxonomy represents the type concept implicitly.

Of course, it is possible to define business objects in much the same fashion as in an object-oriented design tool. The BPMO contains some business object definitions, which have been defined in accordance with object-oriented design techniques. Thanks to the mappings between business entities and business objects, both business analysts and software engineers will “feel at home” in their respective domains. The business analyst can concentrate on business aspects without needing to “think object-oriented”, while the software engineer can focus on technical aspects. In essence, the BPMO implements a loosely coupled approach, providing the much-needed bridge between business and IT.

Conclusion

As has been shown, the Business Process Management Ontology (BPMO) helps eliminate the “understanding gap” between business experts and IT experts. It is based on a coherent information model, which provides for a mapping of business aspects and IT aspects, thus making a significant contribution towards better alignment of IT with business.