

# Role of Interoperability in Business Application Development

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## 1. Introduction

Interoperability in computer systems permits different systems to interact with one another and users to interact with multiple systems in a seamless fashion. Likewise, interoperability in business application development permits smooth interaction between service, support, and sales business areas thereby enhancing the efficiency of the overall business application development. In this paper, we look at interoperability issues associated with business development evolution. We first investigate a model for business application development that provides us with a framework for understanding and controlling application evolution. We then discuss how interoperability can be accomplished among service, support, and sales business areas and give an example of how an enabling platform was used for this purpose. Finally, we look at challenges confronting us as we move toward more interoperability in businesses application development. The discussion is oriented towards development of service applications; however, the concepts are applicable to product development as well.

## 2. The Business Development Model

The business development model proposes that business applications evolve through five stages of growth (Figure 1). The

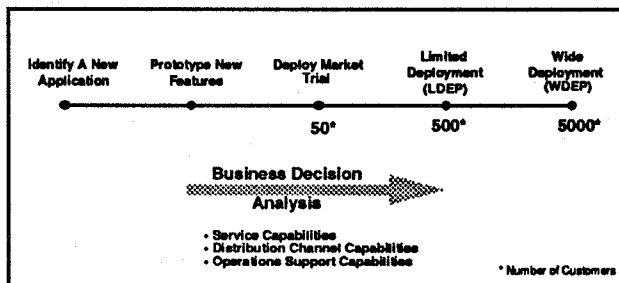


Figure 1: Evolution of a Service  
(Sales Process of an Idea)

premise of the model is that a controlled and orderly evolution is necessary to optimize the opportunity for return on investment. The model presumes that using an incremental growth mechanism, wherein each stage has well defined goals that must be met before proceeding to a subsequent stage, provides the means for controlling investment at a pace that is consistent with the rate at which understanding of the evolving business application is acquired. In this respect there is no short cut to cost-effective business development; it is necessary to evolve through each of the stages in its turn because in this way one obtains the practical experience to tune (fix) the application and also the foundation for understanding what is needed for the next stage. Investment in research and development can quickly be wasted without constantly getting constructive feedback from the

market place; business development should never be predicated on judgment decisions alone without validating assumptions in the market.

### 2.1. Stages

The primary factor that determines investment for each stage of development is the scope of application deployment represented by number of customers supported by the application. Consequently, number of customers is used as the basic discriminator between stages in the model. Typically, each stage exhibits no more than a tenfold expansion in number of customers over the prior stage because of human limitations in extrapolating experiences by more than an order of magnitude.

During the application identification stage an application is defined to fit the perceived need of a person or a business function opportunity, technology alternatives for implementation are evaluated, and alternative solutions to satisfy the need are considered.

Application prototyping must demonstrate that the identified application can be implemented and that it is functional. Typically the prototype is tested by about five end users with the understanding that the prototype is a "sunny day" environment. Input from prototype users is used to improve the product capability for satisfying end user needs and to uncover deficiencies in design. At this stage the market opportunity is assessed, potential competitors along with their strategies are evaluated, and a business strategy for attaining market share is produced.

Market trial deployment must demonstrate that end users perceive value in the application, are able to integrate the product with their existing business processes, and that a potentially sizable market exists. During the trial the logistics for customer service, operations support, and sales channels are worked out. Usually the market trial is provided free-of-charge to end users in return for their input on demographics information and their reaction to the product. The desirable scope is about 50 end users. The trial should be expanded to a larger number of participants if predicted usage is light and if the trial budget can accommodate it.

Limited deployment must validate that the market for an application really exists and that revenue can be generated; now customers need to demonstrate their willingness to pay for the application. During this stage the service, sales and support issues worked out during market deployment are upgraded for a larger customer base. The desirable scope is about 500 end users. This level of usage facilitates the identification of early-adopter, niche-market segments.

Wide deployment upscales service, sales, and support to a customer base that typically starts at about 5000 end users and the business model defined margins are validated. Practically, wide

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deployment is not just a single stage but multiple sub stages supporting increasingly larger customer base sizes.

## 2.2. Stage Transitions

Transition from one stage to another is predicated on meeting specific predefined success criteria. The success criteria not only provide goals for delimiting the end point of each stage; they also are designed to optimize successful transitioning to the next stage. We have adopted this approach from a process developed by Edison that he used to reduce resistance to the acceptance of new/innovative products in the marketplace [BA]. Figure 2 lists

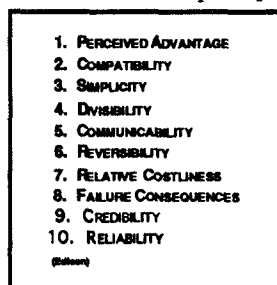


Figure 2: Tactics for Reducing Resistance to Innovation (Edison)

the ten tactics used by Edison in this process; on the average, when all ten tactical goals were satisfied, Edison successfully introduced products nine out of ten times. We have selected success criteria parameters for each business development stage based on evaluations of over 100 start up projects, examination of barriers to success that they experienced, and application of Edison's tactics for successful product introduction.

### 2.2.1. Success Criteria

Success criteria enumerate the goals for each stage of business application development. In particular, the criteria specify the desired return on investment, how to quantify customer satisfaction, service feature capability goals, and what constitutes suitability for transitioning to the next stage (Figure 3).

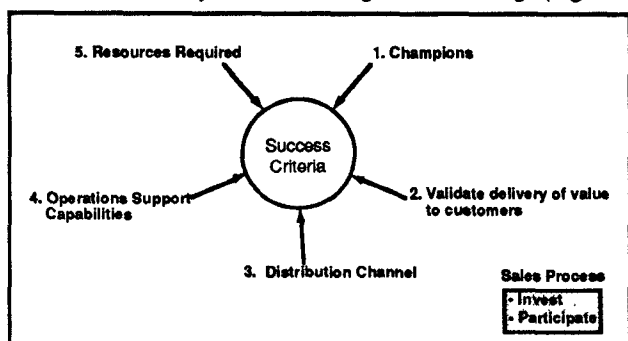


Figure 3: Success Criteria Categories

The success criteria for a stage is a deliverable that is specified during the prior stage. For example, success criteria for limited deployment is specified during the market trial stage based on understanding gained during the trial. The success criteria are used to monitor progress of business development and focus work activity to stay consistent with success criteria goals. Indeed, the criteria may lead to modifications in the application and even to changes in the success criteria themselves based on feedback from the market in terms of usability, cost, and timeliness factors.

The success criteria also provide another important function. The criteria are fundamental in the due diligence process. They produce data and information that is required to continue the sales

process by encouraging investment and/or participation in the development process.

### 2.2.2. Stage Transition Barriers to Success

The dominant cause of unsuccessful stage transitioning occurs because although substantial resources are frequently invested in application development, there is typically insufficient time and/or resources allocated to permit making adjustments to the development process in response to market feedback.

A second cause of unsuccessful application development is due to poor management of application growth. Uncontrolled growth can be precluded by adhering to the business development model. However, even when complying with the model, inability to transition from one development stage to another is a significant barrier to success. In particular, we have observed that one of the biggest causes of failure is the inability to transition an application from trial to limited deployment. This particular transition demands a change from the less restrained atmosphere of the trial environment to the harsher climate of limited deployment environment where reliable operations, effective sales and distribution channels, and a revenue stream are imperative.

Other contributors to stage transition failure are inability to hand-off to other business functions when a transition occurs, inability to up-scale the application for greater size, and inability to deal with the associated logistics that one encounters in selling, distributing, and supporting the application. Adherence to the success criteria can assure that the application is sufficiently well defined to permit transition to subsequent stages.

### 2.3. Business Decision Analysis

Business decision analysis is the primary mechanism for monitoring and controlling business application development and its associated cost (Figure 4). Business decision analysis

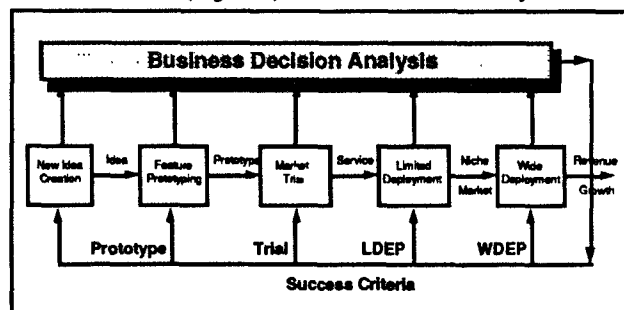


Figure 4: Business Decision Objectives

accomplishes this by monitoring the ongoing status of an application and evaluating this status in terms of three objectives:

**Success Criteria.** Business decision analysis compares the on-going status of the project to the success criteria for the current stage of business application development. In so doing it identifies potential risk areas that appear in conflict with the success criteria and may mandate resource refocusing or alternatively may require modifications to the success criteria. In addition, business decision analysis provides the primary input for determining when an application can be transitioned to the next stage of evolution. Since subsequent deployment stages typically imply (considerable) increased investment, business decision analysis is important in ensuring that return on research and development investment is optimized.

**Service Improvement.** Business decision analysis provides guidelines for improving service, for evolving new applications, and for delivering and refining new features during each stage of deployment. It accomplishes this by quantifying and measuring

the value of a service to its customers. By systematically monitoring these service value parameters, business decision analysis can assist in efficiently optimizing service value for each active user. For example, the process quickly identifies users having problems with the service by anomalies in their usage or service activation patterns.

**Market Expansion.** Business decision analysis provides guidelines for efficiently expanding the application service. For example, it can identify characteristics of potential customers who may be targeted for cost effective sales of the service for both direct and third party distribution channels. Business decision analysis can also identify potential niche markets of early service adopters as well as potential new service features arising from irregularities in usage patterns that customers exhibit.

### 3. A Business Application Example

We have applied the concepts described in this paper to a number of business application developments. One of these involved a voice messaging application that is currently available for elementary, middle, and high schools. The application permits teachers to leave voice announcements regarding course work and home work assignments that parents can access and listen to in order to find out what their children should be doing in school. It is typically implemented by providing each teacher or at least each course with a voice mail box. A range of such services are being deployed by Bell Operating Companies (e.g., Ameritech, BellSouth, and USWest) and audio text service providers.

We participated in the limited deployment stage for the application and resolved a number of interoperability issues by using enabling platforms (Figure 5). In particular, we developed

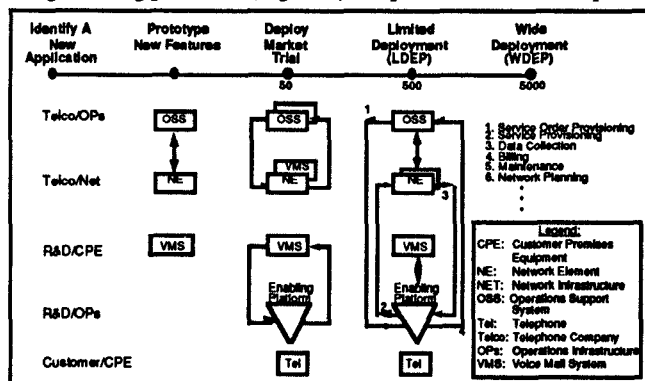


Figure 5: Hybrid Solutions in a Limited Deployment Environment

service and support capabilities. The platform served as a centralized repository for service provisioning data and maintained customer information and voice mail application information for each customer. The platform accessed multiple voice mail systems (VMS) to create and update customer applications. It received requests for new customers or changes in customer applications from customer services and maintained status of the customer changes in a local database. It forwarded customer creation and change requests to Bell Operating Company personnel and received electronic acknowledgments indicating request processing completion from Bell Operating Company operations systems (OSS). It also accessed and updated an external customer service tracking database with customer information. The enabling platform also served as a centralized collector of raw data from the many voice mail systems. Automated analysis was performed by the platform to generate monthly service reports for each client school by incorporating the provisioning information and raw usage data available.

## 4. Challenges in Business Application Development

There are numerous challenges in business application development that are associated with actively engendering business area interoperability. We discuss some of the leading ones based on our experiences.

### 4.1. Business Area Interactions

The ability for business areas to interact, share information, and hand-off responsibilities is fundamental to efficient business application development. This requires that the different business areas know and accept the roles that each other has and be willing and able to coordinate their efforts in working closely together. Often this arrangement breaks down because at one extreme turf battles ensue over ownership and at the other extreme the individual business areas want to narrow their business development focus to their own area to allow more freedom and to permit them to speed up their activities.

### 4.2. Sales Channels

The inability to develop effective sales channels (marketing, sales, and distribution) is a major barrier to success for new applications. Frequently, sales channel development is put off until too late in the development process or attempts to exploit existing sales channels fail because the application or product does not receive sufficient support. For example, startup applications are frequently ignored because the compensation per sale is viewed as too small. Sales channels are responsible not only for putting the sales and distribution logistics in place but also for developing sales and pricing strategies and for implementing training for their sales and distribution personnel.

Good, experienced sales people are a valuable asset and critical to sales channel viability. Proper selling techniques require the sales person to understand the market, the competition, the application/product, and also establish a relation with the client. The effective sales person must be able to explain the value of the application to meet the needs of the client over the competition. In addition, the effective sales person does not walk away after a sale but stays in touch with clients and consistently interprets client feedback, such as complaints and requests for new features, as input for maintenance and feature planning.

### 4.3. Business Decision Analysis

Business decision analysis is a key factor in business application development. As such, we conclude our discussion of challenges by considering those associated with business decision analysis.

#### 4.3.1. Data Acquisition and Analysis

To properly analyze the business application, data must be obtained from all three business areas. For example, usage data is collected from equipment supporting the application and used to understand usage patterns and engineering needs; demographics data are collected from customer services personnel and/or sales personnel and used to discern end user traits; and sales data are collected to assist in determining marketing patterns. Collection of this data is frequently a logistics problem since one finds myriad local databases with data in different formats and inconsistent, redundant data. As a consequence, controlling data quality becomes paramount to the integrity of business decision analysis. Control of data quality requires management of the data collection process by assuring that the collected data is relevant and correct. It also requires managing the on-going analysis process by assuring that standard analysis procedures are followed and that care is used in evaluating and interpreting the results of the analysis.

#### 4.3.2. Levels of Analysis

Business decision analysis must evolve with each stage of business development. As an application evolves the analysis capabilities must become more sophisticated both to handle the growth in size and also to analyze progressively finer nuances as the application becomes better understood (by prior business decision analysis). Business decision analysis is continuously performed at three different levels. First, identify the needs of the marketing organization; second, perform interactive data analysis that will meet these needs; and third, automate the analysis process to create and distribute the analysis results to appropriate decision makers in a cost effective manner

The marketing needs analysis produces a set of questions that need to be answered as part of the success criteria for each stage of business development. For example, during a recent service trial, marketing wanted to identify the characteristics of early service adopters, heavy service users, non-users of the service, and the duration of the stabilization process for new users to become accustomed to the service.

Interactive analysis is typically the second level of analysis that one performs. Interactive analysis consists of trial and error, manual data massaging to clean up the data, to understand the data, and then to begin to discern patterns in the data. Generally, interactive analysis should be the only form of analysis used during prototyping.

The third level of analysis includes the automation of the analysis process, manufacturing of reports, and report distribution, preferably electronically, to decision makers. When the interactive data analysis must be delivered on a periodic basis, automation facilitates significant cost reduction as well as timely delivery of the information thereby contributing additional speed up to the business development process.

A usage behavior pattern was an early product of the analysis performed for the five month trial. Once the usage pattern was baselined for the customer population as a whole and for specific business segments, the system automatically identifies users that deviate from the norm on a weekly basis. This valuable information is provided as a trigger to a proactive customer service team for processing. Once automated, this activity reduced customer churning by twenty percent and increased the customer satisfaction index by thirty-five percent. The customer satisfaction index measures the value delivered by the service to the customer and the effectiveness of trouble report resolution.

As discussed by Toffler in "Power Shift" [TO], occasionally an analysis report of service usage by customers has more value than the basic service does to the customer. In these cases, the technology that was developed to automate the generation and distribution of reports to internal decision makers is also applicable for cost effective distribution of customer level information on a weekly or monthly basis during a trial.

#### 4.3.3. People

Effective business decision analysis requires multifaceted people to oversee and assure that the business areas are sufficiently measured to optimize success for a venture. Such individuals need to have acquired action knowledge based on experience and expertise in areas such as systems design, software design and development, databases, statistical analysis, marketing, business know how, and pattern recognition ability [DE]. The ability to deploy a team of multifaceted individuals is mission critical. Deployment of the business decision analysis capability performed by a large number of single skilled individuals usually results in lack of focus, limited insight, and general slow down in the business development process.

#### 5. Conclusions

We have introduced a business development model that has been successfully applied in identifying and removing barriers to success in business application development. The model emphasizes that successful handling of interoperability issues in the service, sales, and support areas is key to effective utilization of research and development investment. By applying the model to numerous business development examples, we have identified a satisfactory set of success criteria parameters in the service and operations support areas. Guidelines for success criteria in the sales and distribution channel area are still in the exploratory stage. The utilization of these guidelines in a disciplined manner will enhance the predictability of return on investment for business application development. Success in employing the model is predicated on the involvement of high quality individuals in the business areas.

It is a key competitive advantage to have an effective model that converts research results into marketable products and services in ever shorter timeframes. We are now expanding the model to include technology development and research evolution. Figure 6 is our initial model for the migration of research results

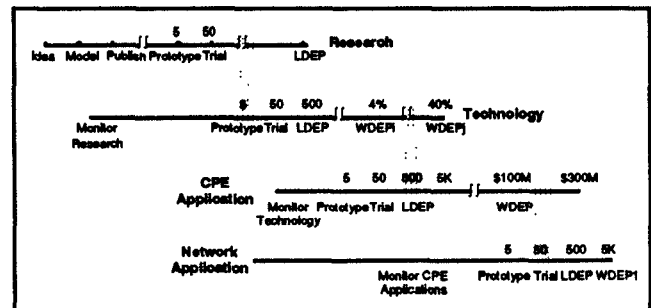


Figure 6: Evolution of Ideas from Research through Technology Development to Application Development

into the marketplace. Two major bottlenecks have been identified, one is the migration of research results into products and the second is the migration of product capabilities into shared services. The ultimate objective is to create specific guidelines for the timely investment in R&D that will cost-effectively transition research results into products, and product capabilities into services. The education system is also recognizing its increased role and responsibility in business development; it must eventually be a major source of change in this area [DE].

#### 6. Acknowledgments

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