Chapter 16
Design of Emerging Digital Services: A Taxonomy

To turn really interesting ideas and fledgling technologies into a company that can continue to innovate for years, it requires a lot of disciplines.

– Steve Jobs

There has been a gigantic shift from a product-based economy to one based on services, specifically digital services. From every indication it is likely to be more than a passing fad and the changes these emerging digital services represent will continue to transform commerce and have yet to reach market saturation. Digital services are being designed for and offered to users, yet very little is known about the design process that goes behind these developments. Is there a science behind designing digital services? By examining 13 leading digital services, we have developed a design taxonomy to be able to classify and contrast digital services. What emerged in the taxonomy were two broad dimensions: a set of fundamental design objectives and a set of fundamental service provider objectives. This chapter concludes with an application of the proposed taxonomy to three leading digital services. We hope that the proposed taxonomy will be useful in understanding the science behind the design of digital services.

16.1 Introduction

There has been a gigantic shift from a product-based economy to one based on services, specifically digital services. This comes as a result of the widespread availability of computers and the pervasive Internet, which together form a digital infrastructure capable of providing digital services in new and different ways. For example, Salesforce.com at the time of the writing has over 900,000 paying subscribers and assiduously claims not to be selling software but a "service" (Salesforce.com 2007). Myspace.com which was founded in 1996 (Alexa Internet 2007) has over 70 million active monthly users (News Corporation 2007) and

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is considered one of the most successful social networking sites on the Internet. These are not isolated examples, but represent a major recent trend that from every indication is likely to be more than a passing fad. Moreover, the changes these examples represent will continue to transform commerce and have yet to reach market saturation.

Is there something truly new and different about these digital services, most of which scarcely existed until recently? We claim that the design process for digital services is distinct from previous design genres owing to the dramatic differences in limitations and possibilities of the new digital infrastructures. The whole process of technology acceptance is bound to be different with this new paradigm of ubiquitous digital services (Lyytinen 2004).

While we agree that there are many approaches for examining the differences in digital services we find the field of organizational systematics to be especially useful (McKelvey 1982). McKelvey describes organizational systematics as "science of organizational differences." He continues that "the development of taxonomic theory. . .is not an outgrowth of sound scientific method in most sciences; it is a prerequisite to such methods." The classification of differences into categories can produce knowledge about the design and design process that may be useful to design researchers.

Thus the development of the taxonomy starts with techniques which are qualitative in nature, since they are based on observation and therefore not initially complete nor entirely conclusive. In this chapter, the development of a classification taxonomy of digital service design serves as a precursor to the scientific study of digital services and in and of itself might not be axiomatic. The motivation of this chapter is to further understand this emerging trend by proposing design taxonomy for the emerging digital services. Using this taxonomy, three successful organizations will be examined to see emerging design patterns. Besides the two previously named examples of Salesforce.com and Myspace.com, the phenomenally successful Itunes.com service will also be profiled using the taxonomy proposed in this chapter. Considering that in a press release Itunes.com announced in April 2007 that after selling more than 3 billion songs, it has "become the largest music retailer in the US." (Apple.com 2007), this is hardly the sign of an insignificant development.

Through this study, we hope to develop a useful method to categorize and classify different types of digital services that will give insight to future designers and guide their design efforts. Clearly, there are some important differences between digital services, existing software products, and non-digital services. While these differences vary from service to service, in developing this taxonomy we hope to see a collection of similarities that will be useful to the field of design science. As far as the authors know the design principles of digital services have not yet been studied.

There has recently been renewed interest in the design science paradigm of research in IS (Walls, Widmeyer et al. 1992; Hevner, March et al. 2004). People have written about what it is (March and Smith 1995), how to evaluate such research (Hevner, March et al. 2004) and also the gap in teaching versus research in systems analysis and design (Bajaj, Batra et al. 2005). ISWorld has also dedicated an entire web site to useful facts and pointers on this research method (ISWorld, 2008). This

chapter attempts to fill a void in the design principles that are behind emerging digital services.

The chapter is organized as follows: first we define digital services. In the next section we rationalize the need for the taxonomy that we develop in the following sections. Then, we analyze three popular digital services using the taxonomy and in the final section we draw conclusions and ponder future research considerations.

16.2 Service Versus Digital Service

For the purposes of this chapter "digital services" are services which are obtained and/or arranged through a digital transaction over IP (Internet protocol). To further distinguish between the idea of a service and a digital service it might be helpful to consider the broad definition of a service and compare the differences. In principles of marketing (Kotler 2007), a service is defined as follows:

> Any activity or benefit that one party can give to another, that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product.

The method of delivery being specified as digital is more restrictive than in a normal service since it requires the ability to connect to and use the infrastructure of the IP-based Internet. Human beings cannot participate in digital services unaided by computer technology. This requirement alone sets higher minimum standards than normal services and requires an agreed-upon set of rules to punctuate the interaction.

The digital service may start digitally, but this does not mean that all interactions are limited to be digital. For example, the Amazon.com web site represents a digital service that often includes the delivery of a physical product such as a book but is still in many ways distinctly different from a physical bookstore. This interaction, however, is fast changing as Amazon.com now offers a host of e-books that are digital entities. Often the utility companies that provide water or natural gas in a community are referred to as the "water service" or "gas service" but the service consists of a physical product for which the utility company performs a coordination and delivery of the supply (i.e., water or natural gas). There is a similarity to this utility model in the provision of digital services where the core benefit that the service provider delivers is often the coordination and delivery of a product or ancillary service and may or may not be linked to a physical product.

The tangibility of a digital service is a second difference versus a normal service, but it depends upon the definition of tangibility. Tangibility used to be broadly understood as ability to be perceived by the sense of touch. In this definition the tangible assets were thought of as the hard assets of the organization and therefore were distinct from services. However, with new business models, the legal and financial definitions have changed to the point where tangible assets are those that can be perceived by senses other than touch. A patented method of business can be financially tangible but not a touchable asset. In fact the non-tangible assets are often the key assets of the organization and are accounted for such on the financial statements.

Another difference between digital and non-digital services is the idea of ownership, which is related to the discussion of tangibility above. Ownership indicates possession, but for a digital artifact, the physical possession might not be the same as having full control. Now digital rights and ownership rights have blurred somewhat, making it difficult to know with certainty who owns what and where the rights of one party stop and the other begins. The concept of digital rights is just one area where the provider of a digital service might represent a large number of digital owners in their interactions with other parties. There has been a shift in the legal protections, where software or a business process used not to be patentable and so early software was not patented, but protected with other intellectual property protections such as copyright in the case of Lotus-1-2-3 (Bricklin 2007). Intellectual property protections are especially important for digital services since by their digital nature they are easily reproduced (Cockburn 2007). On one hand it is important to be able to digitally reproduce these services to support scalability, but also to be able to distinguish digital services from those of their competitors. The ability of one organization to protect and differentiate their service from another can take several forms including secrecy, legal protections, name recognition, and other complex interactions between products and services.

The service providers consider the potential needs of their users and meeting these needs is more crucial than the relational interaction between parties. Non-digital services are often based on a personal relationship that is more important than the service being provided. While for digital services, the service provider might never know the service receiver and indeed supra-functional needs (including the emotional, aspirational, cultural and social) are recognized as more important than functional needs (Weightman 2003) and will necessarily be included in the design of the digital service.

In summary the differences between normal services and digital services include the following:

- Being digital, as least for a portion of the interaction
- A different sense of tangible versus intangible
- Often the "digital service" is a coordination or arrangement of something physical
- The idea of ownership is more subtle including digital rights for a certain purpose versus outright ownership
- Consideration of the overall needs in the digital service is more important than the nature of the relationship

16.3 Research Objectives

While software design is a growing and maturing field, digital service design is an emerging and nascent field. We see several digital services being designed and offered to users (see Table 16.1), yet very little is known about the design process that goes behind these developments. It has been argued that innovation is more

Table 16.1 Sample list of digital service providers (Source: Alexa Internet (2007) unless otherwise noted)

Service name	Brief description	Approximate number of users, sales, or measure of size
Amazon.com	Online commerce vendor selling books, CDs, DVDs, and electronics	Sales of $12.2 billion
Ebay.com	International person to person auction site, with products sorted into categories	Sales of $6.8 billion
Apple.com/iTunes	Web site for purchase of music and videos supporting ITunes software	Over 3 billion songs sold and has become the third largest music retailer in the USA (Apple.com 2007)
Salesforce.com	Provides on-demand customer relationship management (CRM) software services to help companies with global customer communication	Over 900,000 paying subscribers (Salesforce.com 2007)
Myspace.com	Social networking site	70 million active monthly users (News Corporation 2007)
YouTube.com	Video sharing web site	Fourth most visited web site on the Internet
Expedia.com	Travel products and services	Sales of $2.3 billion
Facebook.com	Social networking site	Over 15 million active users (Fast Company Staff 2007)
Wikipedia.com	Collaborative encyclopedia	Among the top 10 visited web sites
Secondlife.com	Provides an online society within a 3D world, where users can explore, build, socialize, and participate in their own economy	Over 11 million residents (Secondlife.com 2007)
Craigslist.org	Centralized network of locally organized online communities offering free classified advertisements	More than 5 billion page views per month and 75 million user posting per month (Craigslist.org 2007)
Worldofwarcraft.com	Online role playing game	Over 8.5 million paying online subscribers (Snow 2007)

a result of iterative emergence than design (Van Alstyne and Logan 2007). Our research was guided by the following questions:

- Is there a science behind designing services?
- Are there specific requirements that the developers use?
- What are the metrics and criteria by which such services can be evaluated?
- What makes a digital service successful?
- It is t hese questions that drive our research objectives.

It is important to note that just because one digital service is influential in one way does not mean that all digital services will be the same. For example, Amazon.com

has an estimated 14,400 employees and Craigslist.com has a reported 24 employees, even though the estimated "page views" between these two digital services has been quite similar during the past month (Alexa Internet 2007). Thus the metrics for finding a "leading digital service" are a little problematic and if defined too narrowly could exclude a whole host of digital services. Developing a metric for measuring influence is beyond the scope of this chapter, certainly the above list includes what would broadly be considered leading digital services.

16.4 Why Taxonomy?

What is a taxonomy of digital services? It is a classification system so that each digital service can be distinguished from every other digital service of a different type. As McKelvey (1982) suggests, classification is often a prerequisite to the scientific method. This is the point of identity of a type, not of the differences of individual members of the type from one another. This ability to distinguish one digital service from another might prove to be rather difficult as a result of the rapid changes even between different versions of one digital service. The dynamic nature of digital services means that we want to attempt to see elements of the digital services that are transcendent of a particular moment and represent the nature of a certain service. For example, while there have been many versions of Microsoft Windows operating systems, the nature of the Windows versions seem to have followed a certain trajectory. Likewise a new software product containing similarities to another existing product is generally spoken of as being in the same family of applications (i.e., spreadsheets, databases, etc.).

16.5 Grounding of the Taxonomy

We started with classifications of digital services by looking at leading digital services, then we looked for important differences between various services. The idea of "leading digital services" is problematic, since this could mean having a large usage, or being financially successful, or something else. So as the start of the iterative investigations we brainstormed about the digital services we knew about or had a well-known reputation. This ethnographic method is both qualitative and verbal based on observation (Plowman 2003). As a basis for the initial classification areas we started with the "apparent intention" of the designers and their "goals" in the design. The brainstorming took us to the same type of quadrant as bird watching (Stokes 1997), seemingly low on usefulness, but vital as a basis for the development of theory.

During the brainstorming of the differences the two dimensions that appear to emerge from the study of digital services include some fundamental design dimensions and fundamental service provider objectives. The fundamental design dimensions include the ideas of service delivery, service maturity, malleability, and pricing. The fundamental service provider objectives include how the digital service

is designed to meet the objectives of business success, technological success, and success of interactions. The expected interactions between these and business objectives are part of the complexity of the taxonomy. Thus, these interaction pathways will provide a matrix for differentiating one digital service from another.

The requirements of a design must "specify the expected services, functions, and features – independent of the implementation" (Henzinger 2007). In Aristole's *Rhetoric*, the combination of artistic and inartistic (or scientific) proofs together formed the design of the speech and these elements need to work together for the speech or other artifact to be successful. This same combination between art and science is one of the issues that make the science of design difficult to isolate. The field of information systems is not alone in this ongoing conflict or integration between science and art, for example, another field which is frequently used as a metaphor for good design is the field of architecture. One of the founding principles is the oft quoted maxim from the roman architect Vitruvius that good architecture has three qualities "commodity, firmness, and delight." (Winograd 1996). The authors seek to identify how these same three qualities could be represented in the field of digital services.

The separation or independence of the implementation from the design means that the implementation needs to be judged on how well the design achieves the functional requirements, but also the extra-functional requirements such as "performance and robustness" and go beyond the basic functional requirements and even achieving Vitruvius' qualities. This combination of art and science makes it possible for the users of the digital service to build a positive long-term relationship which results in attachment of the user to the digital service (Weightman 2003).

16.6 Fundamental Design Dimensions

Through an iterative process of observation and analysis we identified four fundamental design dimensions that we think distinguish one service from the other. That is not to conclude that this is an exhaustive list, but in any iterative approach becomes the starting for the next iteration. These four dimensions are as follows:

- Service delivery
- Service maturity
- Malleability (provider and user)
- Pricing and funding

The above fundamental design dimensions are based on our view that the classical approach of taxonomy (McKelvey 1982) that "three things may be known about any entity – its essence, its definition, and its name." That is, it is possible for two different digital services to be running the exact same software (essence) and serve the same purpose (definition) but have different names and therefore are completely distinct services. These differences should show up as distinct in the taxonomy. This typological approach makes the assumption that artifact implicitly asserts that forms

exist (in the Aristotelian sense) and can be known. The idea of "grand strategy" or the overall goal that drives the enterprise (Tow 2003) may be overstating the design of digital services, but we believe that a form or goal must exist that drives the development forward. It may be that the grand strategy is really unfloding as the designers respond to immediate requirements in such a way as not to confound their previous design decisions.

16.6.1 Service Delivery

The service delivery describes how the service is provided and the range of requirements for the consumer of the service to participate at different levels. Some digital services specify minimum requirements to participate in the service offering and others assume that by connecting to their web site the minimum standards have already been achieved. These minimum requirements of the digital service may often vary along a continuum and emerge as follows (see Table 16.2):

Table 16.2 Delivery requirements

Minimum requirements	
High	Specialized hardware or software required (latest versions or certified hardware/software)
Medium	Standard computers with late (past 2 or 3 years) operating system sufficient
Low	Older computers (3+ years) and operating systems work fine, but specified
None	Minimum hardware/software requirements not specified

Examples of the service delivery requirements include the following:

- Network speed or bandwidth
- Hardware (i.e., memory, CPU, disk, satellite dish) requirements
- Software requirements such as browser or helping applications (e.g., Java)
- Identity requirement (e.g., being known by the other party through registration)

These minimum service requirements often refer to the requirements for basic services with additional services possible with higher than the minimum configuration. This distinction between levels of service is an important one as the digital infrastructure makes possible a large range of service levels to different users, including customization to the needs of different service receivers.

Thus another consideration for the dimension of service delivery is the idea of premium or extra services. Furthermore, the malleability of service delivery is a very important part of pricing of customized services (Hagel and Singer, 1999). Highly customized delivery means that the product can be tailored to individual needs according to timeliness, completeness, etc. Low customization means that there are no versions, for example, low bandwidth or premium customers.

16.6.2 Service Maturity

The idea of service maturity is based on three phases of technological adoption (Liddle 2007) where the nature of the interaction changes at each stage, specifically enthusiast, professional, and consumer phases. A fourth level is added to indicate those services that require little or no interaction with the service provider (Henzinger 2007). Thus the four broad levels are enthusiast, professional, consumer, and embedded systems. Table 16.3 summarizes characteristics of each level.

Table 16.3 Four stages of digital service maturity

Development phase	When problems arise	Technical skills required by system users	Overriding goals of phase
Enthusiast	Technical users solve the problems themselves or check with other technical experts or with the system designers	High	Innovation and creativity
Professional/ business	Formal customer service delivery system with occasional interaction with system designers for severe problems	Medium	Value and reliability
Consumer	Eliminated need for interaction with system designers and best practices are built into the system and the customer service delivery systems	Low	Simplicity and trust
Embedded systems	Eliminated the need for interactions with customer service delivery systems. System failures are handled as artifacts of failures of related systems	None	Automation and dependence

At the enthusiast phase the systems are developed by the system designers and used by individuals with knowledge of the design and its limitations.

Technical systems require high technical expertise on the part of the users; generally these systems are developed by techies for techies and are the initial version of the service. The users of these systems often have direct interactions with the system designers. Advanced knowledge to change initial configurations may be required to use this service. Recent early-stage open-source services are good examples of these.

Professional or business systems are where system designers design support systems and tools to reduce the interaction between designers and users. For severe problems there is an often a customer service delivery system that might permit occasional interaction between system designers and users (e.g., Salesforce.com where the provider of the service might need to give best practices for use). The service scalability comes from the homogeneity and little custom training needed for these services.

Consumer users might need training on the advanced functions of the systems, but the designers should have anticipated this and eliminated the need for interactions with system designers and best practices are built into the systems (e.g., Wikipedia.com is so easy to use that very little professional instruction is available).

Embedded systems are "where embedded software is controlling communication, transportation, and medical systems" (Henzinger 2007) and "indeed, the more seamlessly embedded computers and software are integrated into the products and the less often they fail, the less visible they are." Fully automated systems are where the consumers of the service are receiving the benefits without having to interact with the provider at all once the service has been put into place (e.g., electricity is a service that delivers an intangible product).

16.6.3 Malleability

One surprising part of the list of leading digital services as in Table 16.1 is the speed with which these digital services have become so influential in fostering interactions, utilizing technology, and influencing business, for most of these examples were started in the past 10 years. Therefore, a most desirable quality in digital services is clearly the ability to be malleable or to be able to adapt to changing market needs or requirements. Digital services have an apparent advantage in that they can be dynamically and incrementally changed without the need for the users to upgrade their software, since the functionality of the latest code is deployed from the service provider upon use. Therefore one element within the dimension of malleability is the proportion of the digital service that is physical versus digital. As in the above example comparing Amazon.com and Craigslist.org, the former has an inventory and shipping services, while the latter is almost exclusively digital in nature. The requirement to change more than code on the part of the service provider adds to the complexity of making changes. Therefore the overall concept of malleability is a quality of the digital service such that when malleability is high, changes are easier, with less risk and expense.

This variation contributes to the difficulty in making changes and is reflected in the level of malleability for both the service provider and service user. Tables 16.4 and 16.5 characterize the value of each level of malleability which will be used in the taxonomy:

Table 16.4 Dimensions of service provider malleability

Malleability level	Description
High	Changes are easily made to the digital service offerings by the service provider and require no testing
Medium	Changes require changes to more than a few parts of the service and limited testing
Low	Changes are difficult or expensive to implement and require extensive scenario testing
None	Changes require a complete re-write or complete new implementation

Table 16.5 Dimensions of service user malleability

Malleability level	Description
High	The service user is either not impacted by the changes or is positive toward them
Medium	The service user is impacted in their use of the digital service and must make some changes to their user behavior
Low	Changes are difficult or expensive for the service user to consume and may interfere with their continued use of the product unless there are other incentives to remain as a service user
None	The digital service is like a completely new offering and could have been provided by another service provider

This metric is a reflection on the part of the service provider in making changes to their service offering and is probably best measured by the testing required with changes. A good design should reflect the ability to operate at a high level of service provider malleability at least for the anticipated needs of the digital service. It is understandable why design is often cut short in digital services as there are incredible pressures to be early to market which may short circuit appropriate testing and the finding of design flaws. Likewise as the uses of digital services changes, a service with a good initial design might not be appropriate for the changing needs.

However, if digital services are not well designed, there can be significant barriers in addressing future needs or requirements. These barriers are not only on the side of the service provider but also on the part of the service users, since as users become accustomed to new offerings their behavior changes to become dependent on these services and thereby making changes more problematic. The levels of service user malleability are as follows:

This dimension measures the impact on the service user to changes made by the service provider. It is probably best measured by the amount of accommodation necessary on the part of the service user to continue using the existing service. As digital services, it is possible to maintain a compatibility with previous versions and at the same time implement new or customized offering for customers who want them but this may involve extra work on the part of both the service provider and service user.

16.6.4 Pricing and Funding

The value proposition is an important component in digital services, where users pay for the perceived value. User value is based on the concept of user experience (Boztepe 2007) and can be applied just as easily to services as to products. The different approaches to capture revenue range from different methods of pricing to different sources of revenue and different products or services sold. The revenue logic can include both sales revenues and other sources of financing. High initial cost and nearly zero marginal cost characterize the production and dissemination

of information-intensive products. Digitally delivered products have unique characteristics of the information products to exploit. For instance, it is possible to use a range of pricing alternatives based on user segments and user-selectable options. Varian (1995) has argued that if the willingness to pay is correlated with some observable characteristics of the consumers, such as demographic profile, then it could be linked to the pricing strategy. One strategy is to bundle goods to sell to a market with heterogeneous willingness to pay. The source of operational funds is an important consideration in the design approach as with different funding types the exigencies of design may change dramatically. For example, if an organization is developing the next killer application, but their operational funds are supplied primarily through bank loans they may experience greater urgency than an organization developing the same type of product but has received a multi-year multimillion dollar research grant. The source of funds can be classified in a broad sense as coming from internal sources and/or external sources. Furthermore, the funds can come directly from customers who use the service (sales revenue), indirect sales not from end users of the service (as in the case of advertising revenue), investors who have equity (shareholders), investors who share in some equity benefit (e.g., venture capitalists), credit (in the form of loans), savings, donations, grants, or subsidies, and taxation.

Generic approaches to revenue logic in the software business have been identified by Rajala et al. (2007) as follows:

- *Licensing*, that is, license sales and royalties as the main source of revenue
- *Revenue sharing* with distribution partners or profit sharing with users
- *Loss-leader pricing*, meaning giving something for less than its value. This is done, for example, in order to increase the customer base for later revenue, or, to support sales of some other part of the product/service offering
- *Media model*, where the revenue is based on advertisement sales either through advertisement in the user interfaces of software or by selling user information for advertisers
- *Effort-, cost-, or value-based pricing*, which is a common approach in customized or tailor-made software solutions and made to order software projects
- *Hybrid models* as various combinations of the above

Let us briefly consider the social networking sites such as myspace.com or facebook.com and the revenue models they use. For example, Facebook.com entered a three year revenue sharing deal with Microsoft for advertising and an agreement to give away 10 million samples with Apple's Itunes.com (Yadav 2006). These sites generally have low startup costs as content is mainly provided by the users themselves. They benefit from the so-called network effect. Most of these sites are successful as they are free to users and rely on advertisers mainly for revenue generation. But we have learned from the dot.com days that value is not click-through or eyeballs but value comes from actual revenues. So beyond advertizing, innovative digital service sites are designing clever ways to monetize their activities. These

include (1) revenue sharing in which two sites link each other and any resultant purchase leads to revenue sharing; (2) premium subscription fees that provide above and beyond basic services including privacy protection; (3) corporate sponsorships. Of course the real and albeit value that these social networking sites have is the untapped potential to mine of user data and their activities. Behind each click lies user preferences and when such data can be made available to marketers, a whole new experience to customization starts. Should the service be designed from the beginning to capture all such user data?

16.7 Fundamental Service Provider Objectives

Besides the fundamental design dimensions, we also have come up with three service provider objectives that are part of our taxonomy. They are as follows:

- Business objectives
- Technological objectives
- Interaction objectives

Digital services are offered to users for the benefit of the users, but the service provider is doing so to achieve certain objectives. While all of these objectives are important, often there is a ranking that has a dominating effect on the design of the digital service. The ranking between these factors executes a controlling effect on the design of digital services.

16.7.1 Business Objective

Most service providers do so to be rewarded financially over the long term. With the new digital services, the number of methods to make money have increased and made it possible for digital services to have a number of sources of income instead of simply their customers. The ability to share the profit from a sale with a variety of participants has supplemented the income of digital service provides in such a way that without it, these otherwise marginal services would not have survived.

The business objective is not just about making money but also about building a successful business which includes brand establishment, customer loyalty, and offering superior customer service. The executive function in the organization usually represents this focus but takes input from many quarters. Where the business objective pressures are too intense, promising technological products are canceled.

Some service providers are able to take a very long view of the design objectives as a result of having a large capital base or support of other sources of income which can remove the urgency to be financially secure. Removing this urgency is not always a benefit to the long-term survival of the service provider as the

pressure given with the need to be financially viable can help service providers make appropriate decisions more quickly.

Some key questions for the business objectives include the following:

- Can design impact customer acquisition and retention and if so how?
- How does the provider of the system make money to keep their service online?
- How important are service enhancements to their growth and sustenance as a going concern?
- How does the provider of the system differentiate their service from that of competitors?

16.7.2 Technological Objectives

The technological objective describes the level of importance of the choice of technological solutions. A Facebook.com engineer describes how they were able to modify the open-source Mysql database to support the more than 2 million new users per week (Sobel 2007). In this case, the system designers are probably more interested in having a certain technology than consideration of business objective or interaction objectives. Often the focus is on more functionality, bells and whistles, and performance factors. While these are certainly important, there is often conflict between IT and the rest of the organization when choosing the technological direction. In the case where the technology is ranked higher than the business objective, a very good idea might fail to survive without due consideration to business and interaction objectives.

Some questions for the technological objective include the following:

- How much control does the service provider exercise over all components of their technology?
- Where is the product in the life cycle?

16.7.3 Interaction Objectives

By interaction, we mean the human–computer interaction and the experience a user gets while using the service. Many Internet firms have thousands or even millions of users, but if they are focused only about driving traffic to their site, their business model might not make long-term sense. Likewise, without consideration for technological objectives, the web site might appear for a time as trendy and therefore successful in the short term. However, what will the interaction of the consumer of the service be with the service provider and other consumers over a longer term? The designers might not be able to fully understand, articulate, and interpret user needs and so a higher level design does not constrain users to a certain way of interacting with the digital service. “Designers cannot always forecast how users will use products” (Weightman 2003) and vis-à-vis digital services. Many of the social

networking sites and their services evolve with seemingly random interactions that then are capitalized as a unique core differentiator.

Principles from the field of product design can be applicable to the design of digital services. Weightman (2003) has suggested that designing for variance involves a modular approach, which has direct applicability to digital services through the use of modular programming techniques (Weightman 2003). Different functional modules can be combined together to synergistically provide digital services which were not conceived of by the service designers. Optimization of the interactions of different modules is often undertaken to improve the overall service quality. Weightman (2003) have suggested that we are moving beyond mass customization to a custom manufacturing realm where "design is too important to leave to designers" and that there needs to be greater collaboration between users and designers.

Some of the questions concerning interaction design include the following:

- How is loyalty encouraged?
- Can customers distinguish between one brand and another?
- Is the digital service easy to learn?
- How does the service provider meet the custom or individual needs of their customers?

16.8 Summary of the Taxonomy

Our taxonomy is presented in Fig. 16.1.

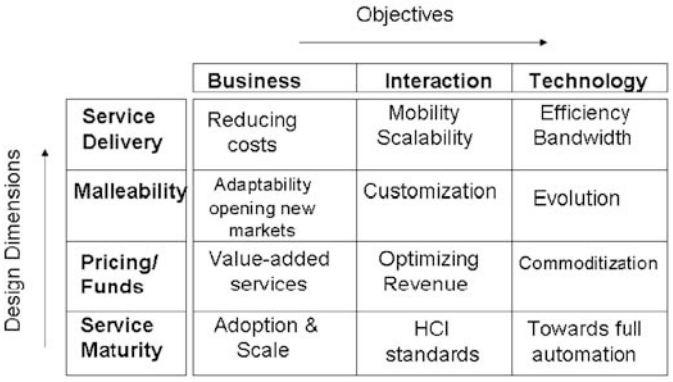

Fig. 16.1 Digital service design taxonomy

A digital service is often a solution to a real-world problem or need but can also be driven by business motivation that there is money to be made in offering such a service. Hence business objectives are important. Since the service is something that is consumed by end users, it is very important to focus on the interaction objectives. How will end user interact with the service implementation? Finally a designer has to develop a set of functions that must be present in the service architecture. Often

there is conflict between keeping it simple versus making too many bells and whistles available. Those are hard design trade-offs that one has to make. For example many people cite the success of Google to its very simple web page (Moogridge, 2006).

The diagram shows the four design dimensions that include service delivery, malleability, pricing, and service maturity which then dictates how best to improve the service. Notice that there are dependencies between design objectives and design dimensions as shown by arrows. For example, business objectives are likely going to impact choices of service delivery and pricing functions. Similarly technological objectives will dictate how malleable a service is. Further there could be feedback from pricing and service maturity that could affect the business and technological objectives and as the digital service evolves, fundamental design objectives could change as well.

16.9 Evaluation of the Taxonomy

In this section we briefly apply our taxonomy on three leading digital service companies to further illustrate its usefulness to study the design of these services.

16.9.1 Salesforce.com

Salesforce.com is one of the leading online CRM (customer relationship management) vendors. They currently have over 38,100,000 organizations as customers and provide a broad range of service offerings. The web site claims Salesforce.com is "The Power of an Idea – Not the Power of Software." While this may sound like marketing hype the company's focus is not in the same vane as the tried and true software vendors.

Fundamental design objectives	Salesforce.com
Service delivery	None – "all salesforce.com CRM solutions are delivered as online utilities, upgrades are immediately available with no corresponding hardware requirements" (Salesforce.com 2007)
Service maturity	Professional/business – subscription-based customer service (Salesforce.com 2007)
Malleability (provider and user)	
Service provider	Unknown
Service user	High (Salesforce.com 2007)
Pricing and funding	Premium subscription fees
Fundamental business objectives	
Business objectives	High
Technological objectives	High
Interaction objectives	Low

16.9.2 Myspace.com

Myspace.com is one of the largest social networking sites on the Internet with over 70 million active monthly users (News Corporation 2007).

Fundamental design objectives	Myspace.com
Service delivery	None
Service maturity	Consumer – no customer service phone number
Malleability (provider and user)	
Service provider	Unknown
Service user	High
Pricing and funding	Revenue sharing and corporate sponsorships
Fundamental business objectives	
Business objectives	Low
Technological objectives	High
Interaction objectives	High

16.9.3 Itunes.com

Itunes.com is an Internet provider for the sale of music and videos supporting ITunes software. The cost of each song are a standard price at 99¢ each (USA) and similar prices in other currencies. The following table shows the evaluation of the ITunes.com (also known as Apple.com/ITunes) according to our taxonomy.

Fundamental design objectives	ITunes.com
Service delivery	High – Itunes software required – free download
Service maturity	Consumer
Malleability (provider and user)	
Service provider	Unknown
Service user	High
Pricing and funding	Premium subscription fees
Fundamental business objectives	
Business objectives	High
Technological objectives	High
Interaction objectives	Low

16.10 Future Research Considerations

Platforms that offer digital services are emerging to be an important area of research and study. The design of such systems is not well understood although many of the recent services are flourishing both in terms of subscribers they have and the kind of revenues they are generating. In this chapter, we take the taxonomy approach to

illustrate salient design features that apply to these emerging services. This is the first such study as per our knowledge.

In this preliminary attempt, we have identified several key design dimensions and service provider objectives that play an important role in both the success of the service platform as well as the business. We have discussed these dimensions and objectives to provide into what role they play. In the near future, we hope to conduct detailed qualitative interviews and quantitative data collection from digital service companies to map the taxonomy and uncover more interesting facets about their design. The science of design is a nascent field in the field of information systems and it will be very difficult to establish a formula for design when the designers do not know what the goals of their designs will be.

References

Alexa Internet, I. (2007) The Web Information Company. Retrieved December 17, 2007.

Apple.com (2007, July 31) iTunes store tops three billion songs. Retrieved November 27, 2007, from http://www.apple.com/pr/library/2007/07/31itunes.html .

Bajaj, A., D. Batra et al. (2005) Systems analysis and design: should we be researching what we teach? *Communications of AIS* 15, pp. 478–493.

Boztepe, S. (2007) User value: competing theories and models. *International Journal of Design* 1 (2), pp. 55–63.

Bricklin, D. (2007) Why didn′t we patent the spreadsheet? Were we stupid? Retrieved November 2, 2007, from http://www.bricklin.com/patenting.htm .

Cockburn, I. (2007) Assessing the value of a patent: things to bear in mind. Retrieved October 30, 2007, from http://www.wipo.int/sme/en/documents/valuing_patents.htm .

Craigslist.org (2007) Craigslist fact sheet. Retrieved December 20, 2007, from http://www.craigslist.org/about/factsheet.html .

Fast Company Staff (2007) Facebook by the numbers. Retrieved December 20, 2007, from http://www.fastcompany.com/magazine/115/open_features-hacker-dropout-ceo-facebook-numbers.html .

Hagel, J. and M. Singer (1999) *Net Worth*, Harvard Business School Press, Boston, MA.

Henzinger, T. and S. Joseph (2007) The discipline of embedded systems design, *IEEE Computer* 40 (10), pp. 32–40.

Hevner, A. R., S. T. March et al. (2004) Design science in information systems research. *MIS Quarterly* 28 (1), pp. 75–105.

Kotler, P. and A. Gary (2007) *Principles of Marketing*, Prentice Hall, Englewood Cliffs, NJ.

Liddle, D. (2007) *Designing Interactions*, The MIT Press, Cambridge, MA.

Lyytinen, K., Y. Youngjin, U. Varshney, M. S. Ackerman, G. Davis, M. Avital, D. Robey, S. Sawyer, and C. Sorensen (2004) Surfing the next wave: design and implementation challenges of ubiquitous computing environments. *Communications of the Association for Information Systems* 13 (Volume 14, 2004), pp. 697–716.

March, S. T. and G. F. Smith (1995) Design and natural science research on information technology. *Decision Support Systems* 15, pp. 251–266.

McKelvey, B. (1982) *Organizational Systematics: Taxonomy, Evolution, Classification*, University of California Press, Berkeley and Los Angeles, CA.

Moggridge, B. (2007) *Designing Interactions*, Massachusetts Institute of Technology, Boston, MA.

News Corporation (2007, July 12) MySpace outperforms all other social networking sites. Retrieved November 12, 2007, from http://www.newscorp.com/news/news_345.html .

Plowman, T. (2003) *Ethnography and Critical Design Practice*, The MIT Press, Cambridge, MA.

Rajala R, J. Nissiläa, and M. Westerlund (2007) Revenue models in the open source software business, in St. Amant K. and B. Still (eds.), *Handbook of Research on Open Source Software: Technological, Economic, and Social Perspectives*, IGI Global, Hershey, PA, pp. 541–554.

Salesforce.com (2007) Customer support: ensuring CRM success. Retrieved December 2007, from http://www.salesforce.com/services-training/customer-support/.

Salesforce.com (2007, September 17) Salesforce.com Dreamforce 2007: financial review. Retrieved November 13, 2007, from http://www.salesforce.com/assets/pdf/investors/Dreamforce_CFO_FINAL.pdf.

Salesforce.com (2007) Salesforce.com enhances enterprise functionality across all applications. Retrieved December 26, 2007, from http://www.salesforce.com/company/news-press/press-releases/2003/02/030210-2.jsp.

Secondlife.com (2007) Second life: economic statistics. Retrieved December 20, 2007, from http://secondlife.com/whatis/economy_stats.php.

Snow, B. (2007) GigaOM top 10 most popular MMOs. Retrieved December 20, 2007, from http://gigaom.com/2007/06/13/top-ten-most-popular-mmos/

Sobel, J. (2007, December 21) The Facebook blog: keeping up. Retrieved December 26, 2007, from http://blog.facebook.com/blog.php?post=7899307130.

Stokes, D. (1997) *Pasteurs Quadrant: Basic Science and Technological Innovation*, Brookings Institution Press, Washington, DC.

Tow, R. (2003) *Strategy, Tactics, and Heuristics for Research*, The MIT Press, Cambridge, MA.

Van Alstyne, G. and R. K. Logan (2007) Designing for emergence and innovation: redesigning design. *Artifact* 1 (2), pp. 120–129.

Varian, H. R. (1995) *Pricing Information Goods*, University of Michigan.

Walls, J. G., G. R. Widmeyer et al. (1992) Building an information system design theory for vigilant EIS. *Information Systems Research* 3 (1), pp. 36–59.

Weightman, D. a. M., Deana (2003) *People are Doing it for Themselves, Designing Pleasurable Products and Interfaces*, ACM, Pittsburgh, PA.

Winograd, T. (1996) *Bringing Design to Software*, ACM Press, New York, NY.

Yadav, S. (2006) Facebook – The complete biography. Retrieved December 20, 2007, from http://mashable.com/2006/08/25/facebook-profile /