

Micro-Commoditization and Pay-As-You-Consume (PAYC) Model for Digital Entertainment Products – An Application

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Abstract: The new technological developments and business strategies hold considerable promise to eradicate market inefficiencies and unravel a new era of digital commerce. Micro-commoditization and micro-consumption are the two new economic forces in motion, in the world of e-Business. With the advent of electronic commerce there is a shift from the traditional Pay First-Consume Next model (PFCN) and Consume-First-Pay Next model (CFPN) to a Pay-As-You-Consume model (PAYC) configuration. Among the various genre of microproducts, digital microproducts, such as music, movies, news, information items, and video games have a huge industry.

The present work incorporates the concepts of micro-consumption, micro-commoditization and the PAYC model in a web-application named *On-Demand-Music*. The PAYC model enables automatic reduction of balance from the customer's bank account, making the payment process fast and easy. The application enables users to consume digital microproducts (here music) in small granules rather than buying huge bulk of music (e.g. buying an entire CD containing only one or few favorite song(s)).

The Software Development Life Cycle (SDLC) approach has been used to analyze, design, code and test the web-application. Developed using technologies such as Java Server Pages™ (JSP), MySql and various Java plug-ins, the application enables users to listen to their favorite song(s) or parts of chosen song directly from the server.

The usefulness of present work is that it makes the mode of payment easier and brings out the essence of micro-consumption, micro-commoditization and the PAYC model in *music* as an example of digital entertainment microproducts.

Keywords: Case Study in E-Business, micro commoditization, micro-consumption.

I. Introduction

Commerce on the Internet

Electronic Commerce (e-commerce) is a general concept covering any form of business transaction or information exchange executed using information and communication technologies. It takes place between companies, between companies and their customers, or between companies and

public administration.

Electronic Commerce includes electronic trading and goods, services and electronic materials.

Commerce on the Internet is becoming ever more pervasive, reorienting traditional business practices with new strategies and operations. The Internet continues to create new consumer markets that never existed before, new players that position themselves between consumers and producers for efficient market transactions, and new technologies and market drivers that are redefining the processes of production and consumption in a market economy.

Microproducts- The future of Digital Economy.

Micro-commoditization and micro-consumption are the two new economic forces in motion, in the world of e-Business. [2] The producer is said to offer micro-commoditized products, if it disaggregates a product or service into small components and delivers it to consumers in a sequential manner. On the other hand, micro-consumption is the ability of the users to consume such products, to satisfy their on-demand needs. Such products are termed as Microproducts. These new concepts are likely to revolutionize the business practices, in the digital entertainment industry.

Micro-consumption and micro-commoditization have originated from the interaction of newer technologies, evolving global market structures and will be able to change the very concepts of supply and demand, for the future markets. Micro-commoditization is definitely more advantageous both for the buyer and seller as compared to bundling based pricing mechanisms, where buyers only pay for what they use, scarce resources are directed towards higher-valued consumers, and the markets reacts quickly in response to changing demand and consumption patterns. Enhanced resource allocation, dynamic pricing that speedily responds to changing supply demand patterns and the very essence of customization and interactivity are better experienced by consumers in microproducts.

Terms and Definitions

- “Micro-commodity: The ability of a producer to disaggregate a commodity into components of consumption at lower levels of component granularity.
- Micro-consumption: The ability of a user to consume the components at lower granularity levels over time.
- Customization: The ability of the seller to offer a

large menu of fine grained components, enabling customers to tailor their usage according to specific requirements. The shift from SPSU to MPSU modes of consumption.

- **Interactivity:** The ability of multiple users to consume a component concurrently, to enhance interactivity. The shift from SPSU to SPMU modes of consumption.
- **Trade-level contraction:** The shift from the traditional PFCN and CFPN practices to a PAYC configuration.
- **The customization effect** is a consequence of micro-commoditization of digital goods. The customization effect enables the seller to tailor offerings that fit customer requirements, dynamically package them, and deliver a suite of high-level services from a core set of micro-commoditized products.
- **The interactivity effect** arises from simultaneous micro-consumption by multiple users of micro-commoditized seller offerings.

The **trade-level contraction effect** is a natural consequence of the customization and interactivity effects. Trade-level contraction due to customization and interactivity results in short-term and as-needed market trades with natural shifts from traditional PFCN and CFPN to PAYC configuration. Fig 1.2 shows the projected impacts of Trade-level contraction Effects.” [2].

One of the emerging Micro-Markets

The emerging Digital Entertainment Products

Entertainment products, such as music, movies, news and information items, and video games, are intrinsically digital in nature. Generally the industry follows the Pay-First-Consume-Next (PFCN) mode of payment with pricing strategies such as subscription or bundling.

For example, music is sold in albums, which are a collection of songs related to a band or single artist. But since these products are digital in nature, the mode of selling these would change in future. Consumer are no longer inclined to buy music in large bundles as CDs or DVDs, because most items in those chunks may not have much of a consumption utility and hence the willingness to pay decreases. So micro-commoditization is the call of the hour.

Some Insight

“Interpreted in this way, the New or Digital Economy is about dynamics, not static efficiency. It is more about new activities and products than about higher productivity. What is really new in the New Economy is the proliferation of the use of the Internet, a new level and form of connectivity among multiple heterogeneous ideas and actors, giving rise to a vast new range of combinations. There are some measurable effects on productivity and efficiency, but the more important long-run effects are beyond measurement.

“A motivation for the development of microproducts and micropayments stems from the need to assure product quality. A long term subscription of bundled digital products

may be sufficient to guarantee quality based on the reputation of the seller. However, reputation has to be developed after repeated purchases. If sellers know, on the other hand, that the market will end soon-or they are short-run players-it is profitable to cheat by selling low-quality products at high-quality price. Knowing this, would consumers be willing to buy a product from unknown sellers? This problem is magnified if buyers are required to commit for a long-term subscription or to pay for a large bundle of unknown quality. Instead, recent research in contract theory offers some positive evidence that short-term sales may indeed produce higher quality than subscription and bundling. Short-term sales (some involving only one page of information) will be based on micropayments.” [1]

“Microproducts are simply pure digital products that become technologically and economically possible because of the low costs of modifying and distributing digital products in general. They allow consumers to try out products before paying for a long-term subscription or a large bundle.”[4]

The web-application named *On-Demand-Music*.

As seen from above discussion, digital music is an example of digital microproducts. So the web-application was developed with the following features:-

1. The Web-Based application provides a database of music, so that users can listen to their favorite music as and when they like without having to download the song file.
2. It employs the Pas-As-You-Consume (PAYC) model, where there will be automatic reduction of balance from the customer’s bank account. So payment process will be fast and easy.
3. It enables the users to consume digital microproducts (here music), in small granules rather than buying huge bulk of music. (e.g. buying an entire CD containing only one or few favorite song(s))

II. The Sdlc Approach

The SDLC approach followed, simplified the analysis, design, coding and testing phase. So the application was developed, as a software project using the theories and principles of Software Engineering.

Purpose

The web-application provides a database of music, ubiquitously to Internet users and allows them to listen to it directly from the site rather than downloading the music file and then listening to it. It has many business advantages. Firstly, if a large number of users login, then the Website will earn very quickly. Secondly, it provides a database of music, so that users can listen to their favorite music, as and when the like and don’t have to buy music CDs or store music files in valuable hard-disk space. Lastly, the Pay-as-you-consume (PAYC) model is being employed here, where there will be automatically reduction of balance from the customers’ bank account. So the payment process is easy

and fast.

Scope

The application provides easy search and browse options to locate the songs which the user is willing to listen. It has connectivity with the bank's database to authenticate the users' credit card number and also to have the feature of e-payment where users' balance will automatically reduce.

The application also prompts a warning message when the user's balance goes to Rs.5 or less than Rs. 5. This feature ensures that no user can avail the service unless his/her balance in the bank is sufficient. The security aspect was given a lot of priority with lot of consideration done while coding.

General description

The product is perceived as a Web-site which will provide the netizens with unlimited music and will be played directly from the Web-site's server in the Web-browser. Any educated person with average knowledge of the Internet and basic computer skills can use the website.

Assumptions and Dependencies

- Users possess the basic know-how of computer and Internet usage.
- User understands simple English.
- The administrator of the web-application should be proficient in Java Server PagesTM, [3] Apache-Tomcat web-servers, and MySql- database server.

Use case Diagram

The figure below i.e. figure 1 shows the use case diagram and hence explains the way the user and administrator will interact with the web-application. It may be noted that, the use case diagram is more or less self explanatory. However, the user's and administrator's interactions with the web-application will be thoroughly dealt with, later. Also the <<extends>> feature has been used in the *Navigate/Search* use case with *search song* because another use case called *Browse category* is desirable in the web-application and should be added in the later stages.[see appendix].

III. Object Oriented Analysis

OOA consists of the partial static diagram (Figure 2), the Class responsibility collaboration (CRC) cards and the system sequence diagram. Such kind of analysis brings a thorough picture of the application to be developed. However, it is not necessary to discuss all these and present all these analysis in this paper.

Figure 2 show the partial static diagram of the web-application. In the diagram the *user* object initiates the *SearchASong* object, which is captured by the *WebApp* object. The *Playlist* is played by the *user*, which is updated by the *WebApp* and belongs to *AccountInfo*. The object *Bank* helps to determine *AccountInfo*. The various attributes of the

respective objects are shown below their names. Also the interaction of the objects are shown, where one object can interact with many objects.

IV. Object Oriented Design

Identification of the real classes is a very important job, before going forward in the design phase. From the partial static diagrams, a basic idea of what the classes will look like can be identified. The real classes are shown in Figure 3, in the next page. The classes are represented in the standard UML format, showing attribute and functions. For example, the class *Playlist* has No. of songs:int, Duration : double, rate : double as the attributes and *play (song: Object): void* as the only fuction.

Figure 4. shows the collaboration diagram of the web-application. Collaboration diagrams represent interactions between objects as a series of sequenced messages. Collaboration diagrams describe both the static structure and the dynamic behavior of a system. Various notes are show in the diagram, which are in fact self explanatory. This concludes the OOD and it is always advisable to go for coding only after completing the OOD. Also the OOD should be flexible to change later, as one follow a *spiral* model for software development life cycle.

V. Coding

The coding was done according to the analysis and design done previously. Although some new methodology and modifications were incorporated for convenience. It should be noted that, an object oriented language such as JAVATM was chosen to build the application as the analysis were done in the object oriented framework. JAVATM with Java Server PagesTM as the scripting language was used, which is easy to deploy, platform independent and robust. As the spiral model was followed, while coding the OOD part was modified, as and when felt convenient to improve the system performance and make the development easier.

VI. Testing

Various tests were performed to ensure that the web application was working fine and also to locate bugs.

Working of the search option

Various keywords were typed in the search text field and the results were observed. It was observed that if the keyword was the part of the song title or the album's name, then it all the results were displayed. Otherwise no result was displayed.

Reduction of balance from the bank account of the user

As the music was played simultaneously the site earnings should increase, the user's amount should increase and his

balance from the bank should decrease. This was tested and was found to be correct.

User authentication

Various wrong information like invalid credit card number, account number and invalid email address were entered. Javascript and sql commands were used to in the code to authenticate the user's information.

Working of the music player.

The player was tested with various play lists to see if it works in various situations.

Security

Security tests were made by logging off the user and trying to access the search.jsp page ,home.jsp page etc. With the use of sessions class of jsp the security was achieved where it will redirect the page to the login page if the user is not logged in.

VII. Conclusion

Summary

On-Demand-Music - the Web-application shows the application of micro-commoditization, micro-consumption and the PAYC Model. From this application a user only pays for what they consume and hence is the unique selling proposition of the service which they will avail. This web-application presents a business plan, which aims at delighting customers and also introduces to a market of on line digital media streaming, which is open without any major players. Hence that segment of the market is yet to be captured.

The web-application as developed with Java Server Pages™ and MySQL database server is compatible with all platforms as Java™ is platform independent. These technologies are latest and easy to deploy. Also the SDLC approach presents a clear picture of the various stages of analysis, design and development of the web-application as a software project. Also this web-application can be employed to generate raw data, and various data mining tools can be used to derive patterns and hence get to know what the customers wants.

Finally, this web-application as an example of digital entertainment products, shows a new business strategy which can be easily extended to other kinds of similar

products, such as, online newspapers, video streaming, online gaming etc. to name a few.

Scope for future work

On-Demand-Music – the Web-application being developed is just could be tested by the developer. Generally many new bugs appear when software is launched to be used by the users. So this web-application can be released as a beta version to know the bugs.

There are also a few things in the mp3 player which can be improved in future. The player doesn't have the seek option. Because of which consumers cannot drag to those part of the song which they want to listen directly.

There is only the search option to search the songs which the user wants to listen. But there is no browse category option. This is important because sometimes user doesn't know the exact keyword to search for a particular song or album. So after a few attempts and continuously getting no results, the user might get frustrated and leave the website.

Also to populate the database, the administrator should be proficient with MySQL server administration. But a separate Graphic User Environment or GUI can be developed specific to this web-application where it would be easier to manage the database as the database of songs will be huge if the application is launched for consumers.

Finally, there will be many legal and integration matters which will come as it is decided to launch this web-site. Matters like getting the rights from the producer of the music album, integrating the database connectivity with major credit card companies and banks etc. needs to be dealt with as they are few of the prime prerequisite before launching *On-Demand-Music* Web application.

References

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- [3] Hall M, "Core servlets and JSP", *Java 2 Platform, Enterprise Edition Series*, June 2000
- [4] Singh N, "Electronic Commerce: Economics and Strategy", August 11, 2000, page 5 (<http://econ.ucsc.edu/~boxjenk/bookchapters/Bkch9.pdf>)

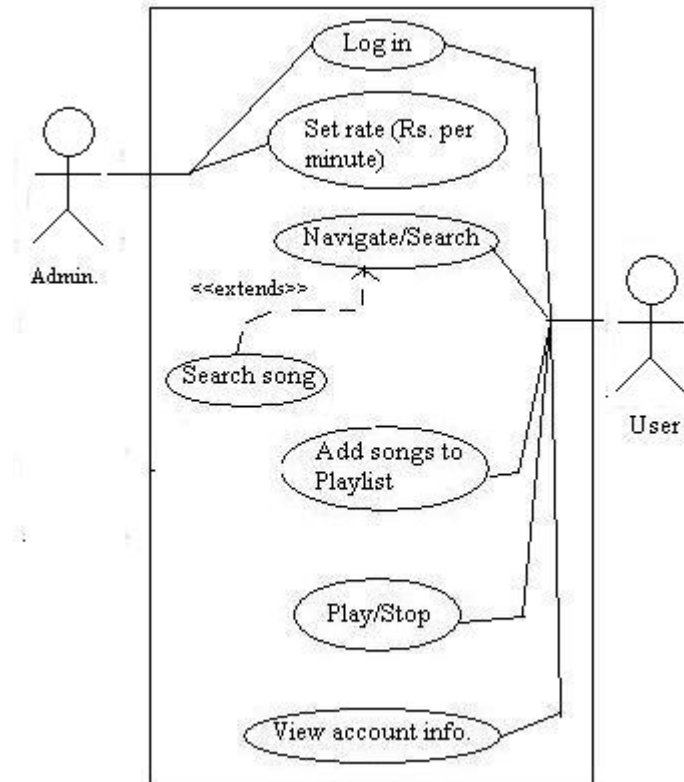


Figure 1. Use case diagram of *On-Demand-Music* web application

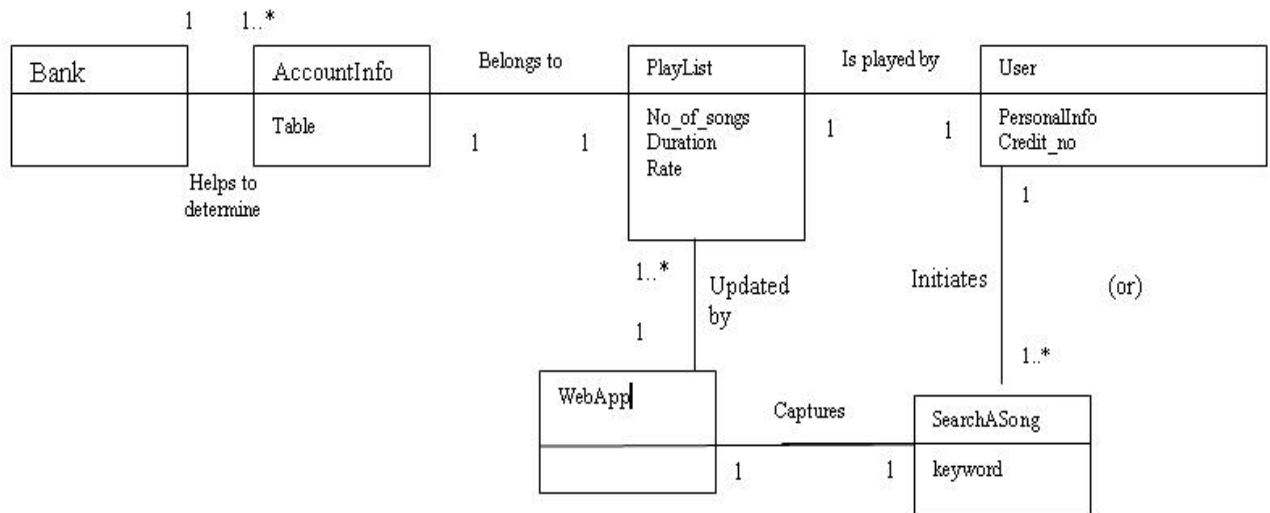


Figure 2. Partial static diagram of *On-Demand-Music* Web application

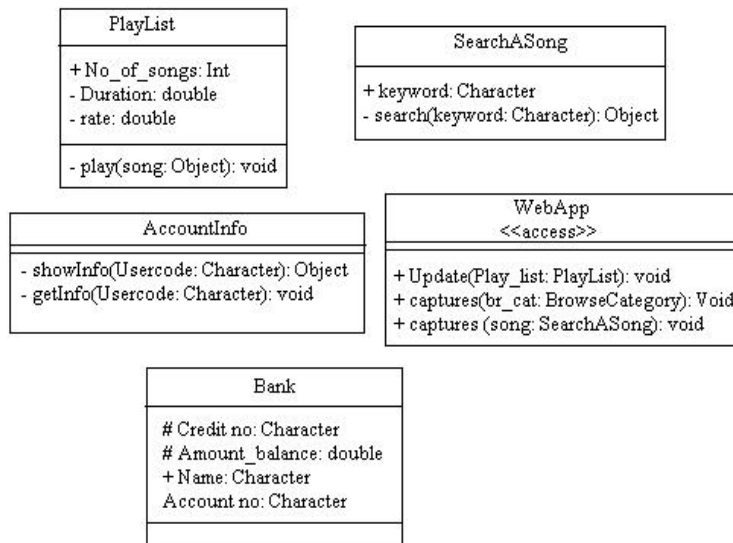


Figure 3. Real class identified for On-Demand-Music Web application

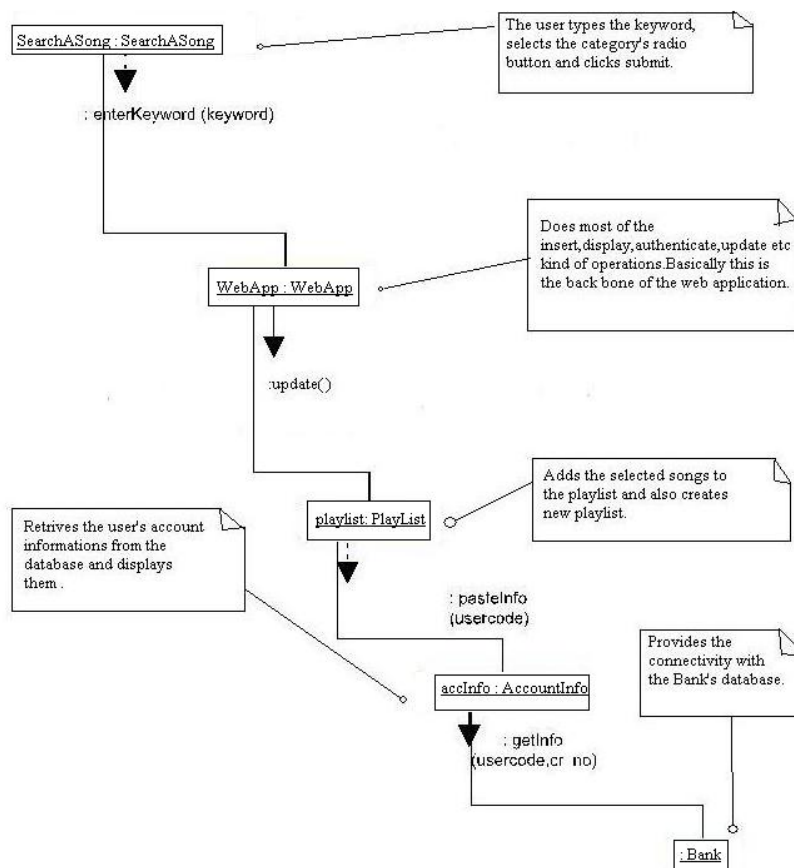


Figure 4. Collaboration diagram of On-Demand-Music Web application

APPENDIX

Screen shots of the various web-pages of *On-Demand-Music* - the Web-application.

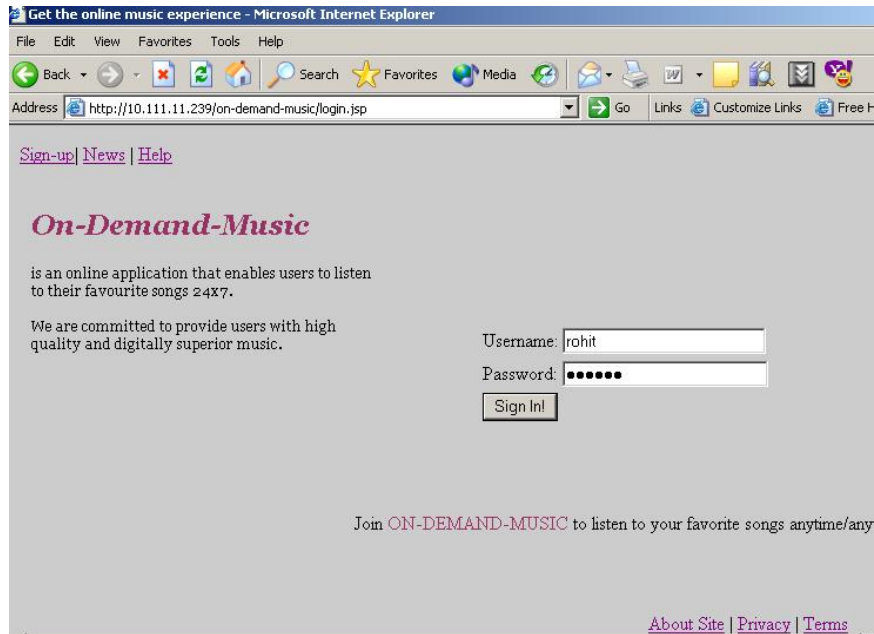


Figure 5. Login page.

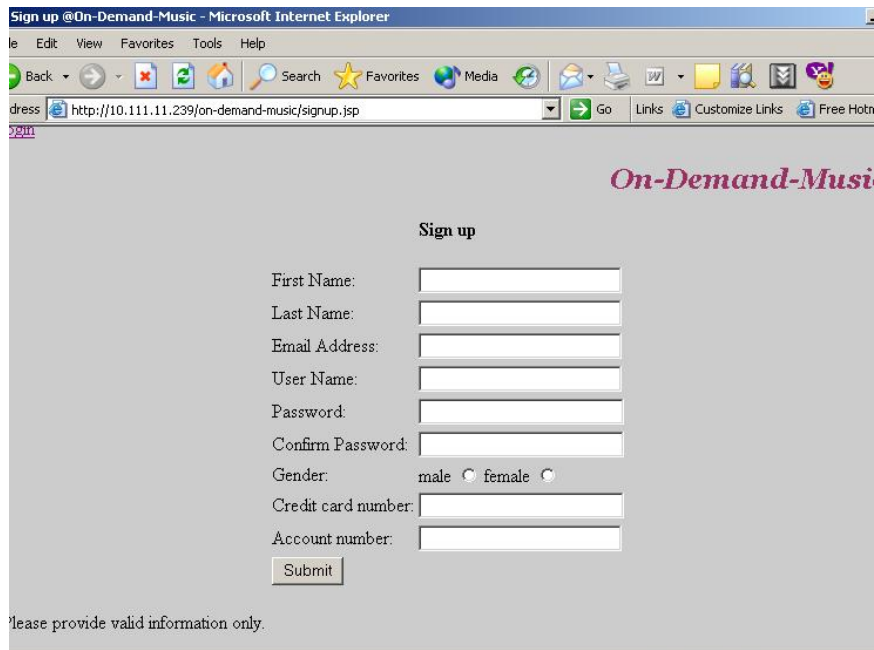


Figure 6. Sign up page.

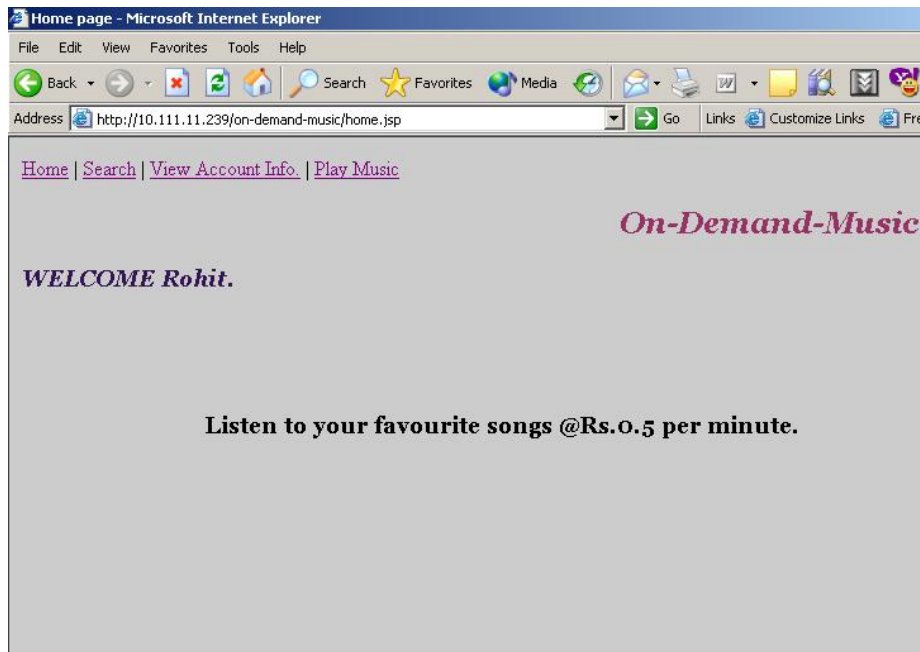
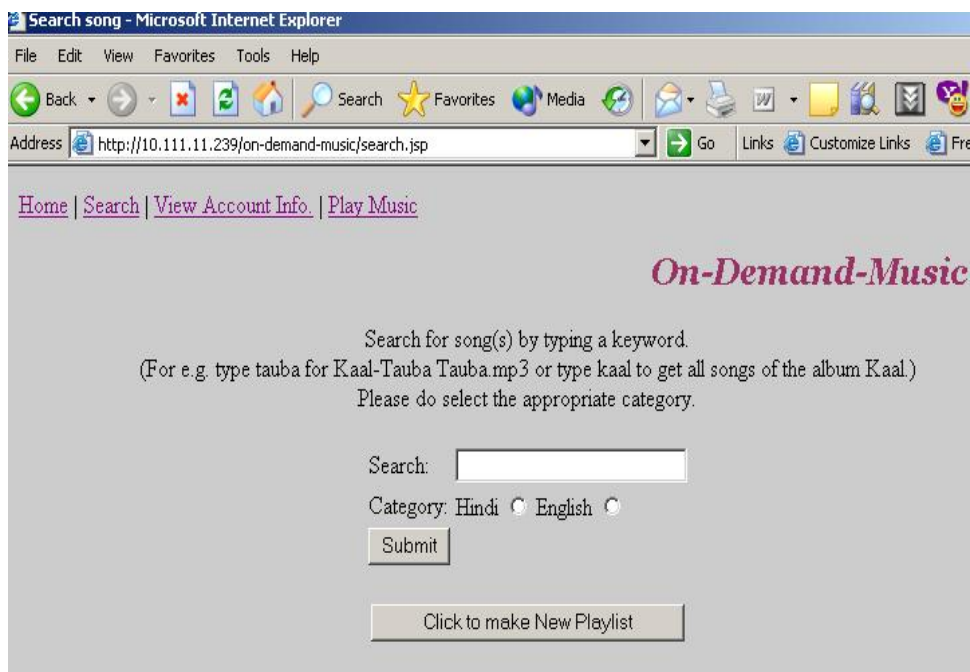
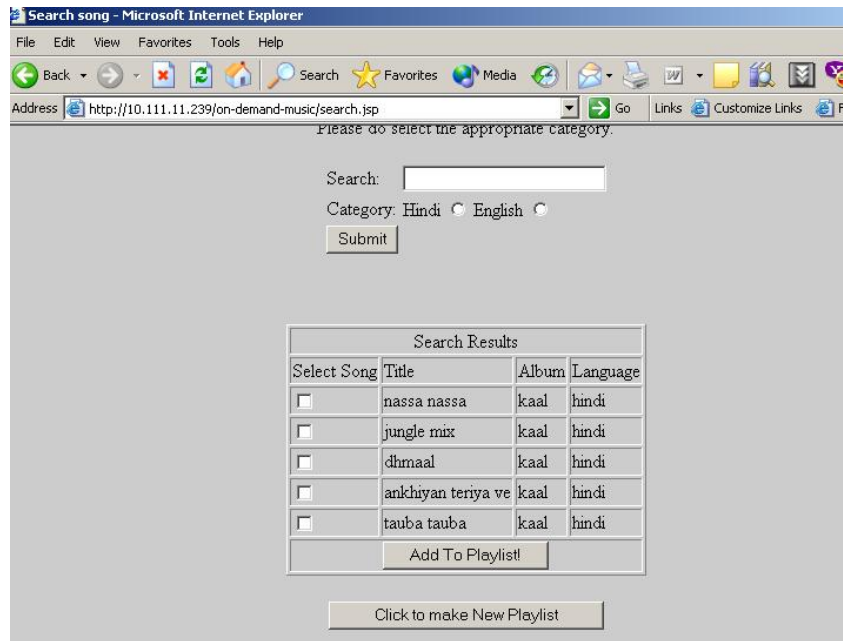


Figure 7. Home page.



(a)



(b)

Figure 8(a) Search page before searching
 Figure 8(b) Search page after getting some search results.

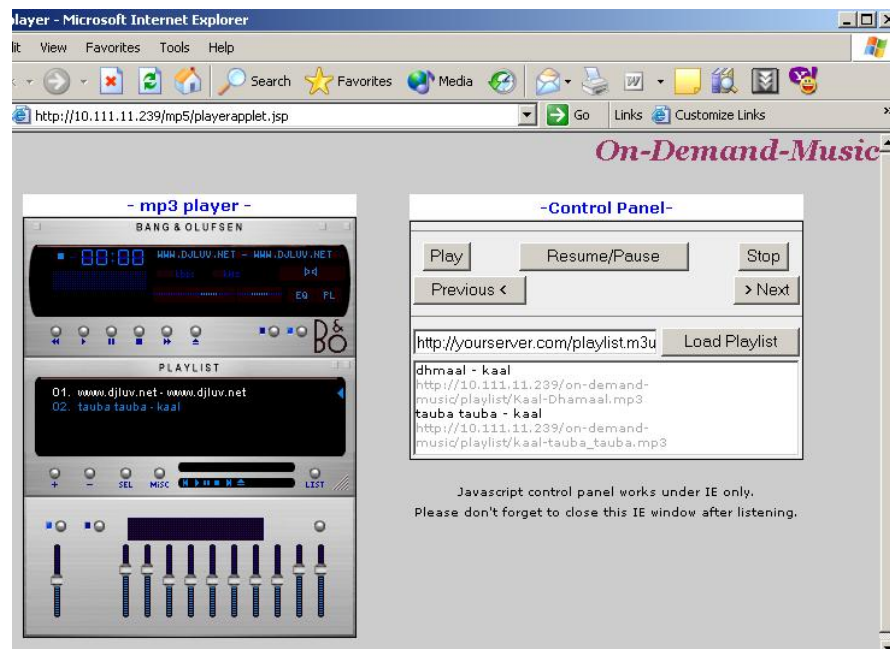


Figure 9 Player applet page with the control panel.

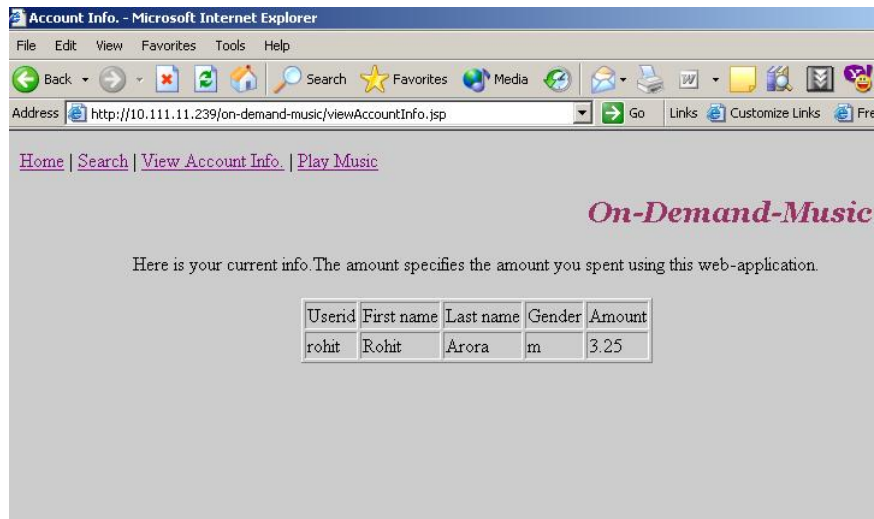


Figure 10. View account information page.

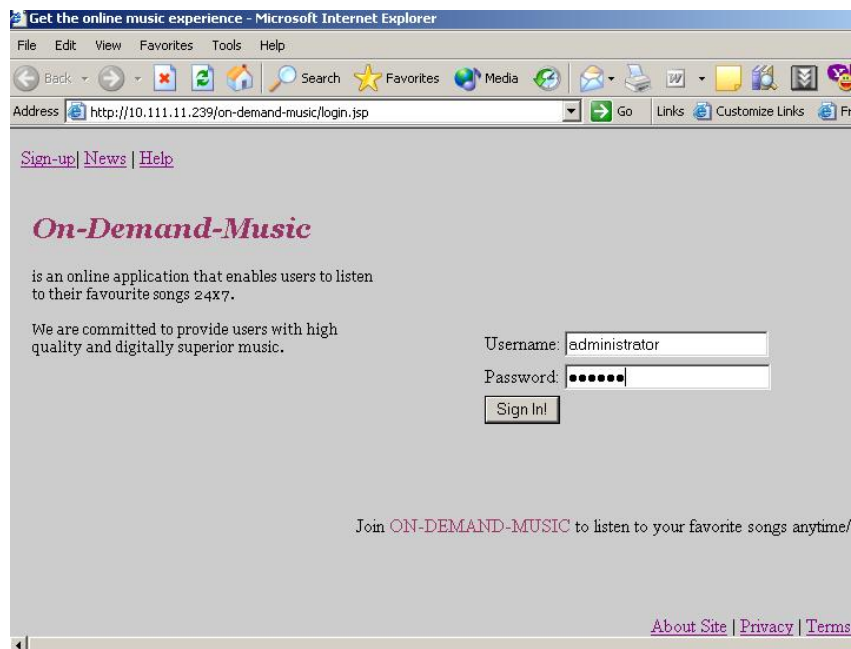


Figure 11. Admin login page

Figure 12 shows the Administrator's page where he can set the Rate/minute offered to users and can also see the site's total earnings.

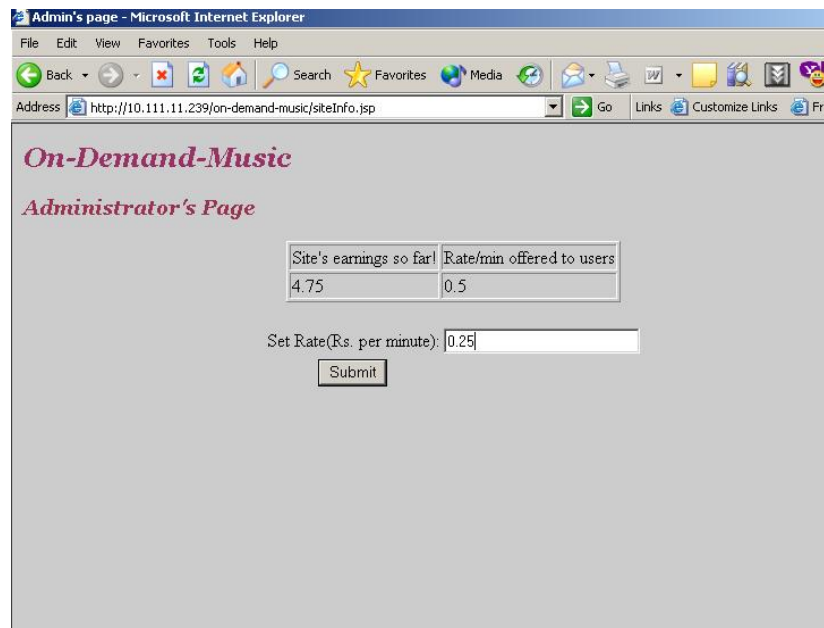


Figure 12 Administrator's page.