Hotel Power Policy Approach to Heterogeneous Online Hotel Information Integration

Yufeng Luo and Jingzhi Guo
Department of Computer and Information Science, University of Macau
Av. Padre Tomás, Pereira, S.J., Taipa, Macau, Tel: +853-397 4890
E-mail: {ma56572, jzguo}@umac.mo

***Abstract*- When developing hotel information platform, the service providers face an important issue, how to attract more hotels to join in their platform without significantly increasing integration cost but maintaining effective information integration? This paper considers the issue in two aspects of business integration policy and technology support, which bring up a novel Hotel Power Policy Approach for service providers to define different hotel partners and integrate heterogeneous hotel information. With this approach, a Hotel Information Collaboration Platform is proposed to implement the hotel power policy for integrating the complex real-world hotel information.**

I. INTRODUCTION

With the development of hotel industry and Internet technology, more and more hotels used the Internet to sell their tourism products. At the same time, many hotel information platforms run by tourism service providers appeared on Internet like hotels.com and Expedia. These platforms integrated and published various hotel service information based on different target markets. Some aim at local hotel products and some target at worldwide hotel services. However, no matter how a hotel information platform is designed, hotel information integration is always a most tough but important issue to resolve [4][6].

Why is the integration of the hotel information tough and difficult? Simply, hotel information systems have typical characteristics of distribution, autonomy and emergence of heterogeneous information systems [2]. Not like aviation industry [1], there are too many individual hotels in hotel industry, where every hotel has its own business size and strategy. Specific to hotel information systems, each of them has different business document templates, product vocabularies, business processes, and the level of electronic management. These lead to the problem of hotel information integration for hotel service providers to deliver online hotel services to consumers.

This paper aims to resolve the above hotel information integration issue through building a new Theory of Hotel Power. Based on this theory, we propose the business policy for integration and briefly introduce our technical solution.

The rest of this paper organizes as follows: The theory of hotel power and its application are firstly presented in Section 2, followed by the hotel information integration policies in Section 3. Section 4 describes a Hotel Information Collaboration Platform (HICP) with its features presented in Section 5. Finally, some related work is discussed and a brief conclusion is given with a summary of contribution and a future work.

II. THEORY OF HOTEL POWER AND ITS APPLICATION

By observation, we have found that hotels have power with regard to hotel information integration. Particularly, *hotel power* refers to the strength that affects the decisions made based on the hotel's bargaining ability in the cooperation of integrating hotel information. For example, a corporate survey of macaufly.com showed, when hotel service providers make cooperation plans with hotels, some hotels wish to join in hotel information systems of service providers, but some share negative attitude toward cooperation plans and tend to reject the proposal. Analysis of the survey shows that nearly every hotel welcomes the Internet platform that may bring travelers to them [4], but most of them consider integration cost and profit brought by hotel information service providers. A general rule is: *the larger and the more well-known hotel is, the less active it is in integration*.

To explain the above hotel phenomena, we build a new theory of hotel power, which hypothesizes that the hotel's initiative of integrating hotel information into the hotel service providers' systems is reversely proportionate to the financial and technical abilities of the hotels, the size of the hotels, and the history of the hotels.

Applying this theory, we propose that hotel service providers should use different integration policies of treating various types of hotels. Our particular method is to identify each hotel's detailed hotel power and to make individual integration policy on each of them. The purpose is to assign a strategic-planning goal and a portion of appropriate fund to a hotel, which can be linked to this particular hotel for integration. The management staff of a hotel service provider could review different hotel integration plans to decide which policy should be applied to a reviewing hotel.

Following the above proposal to hotel service providers on Hotel Power Theory, we made a novel hotel classification through our newly devised *Life-Target Matrix*, shown in Fig. 1, which is used to segment the online hotel market for further making hotel information integration policies for the markets.

The Life-Target Matrix shows that tourist market can be divided into *normal market* and *sumptuous market* with two different hotels lifecycle stages of growth and maturity. Specifically, the Hotel Life Cycle on the vertical axis indicates the life phase of hotel's development, from growth to maturity.

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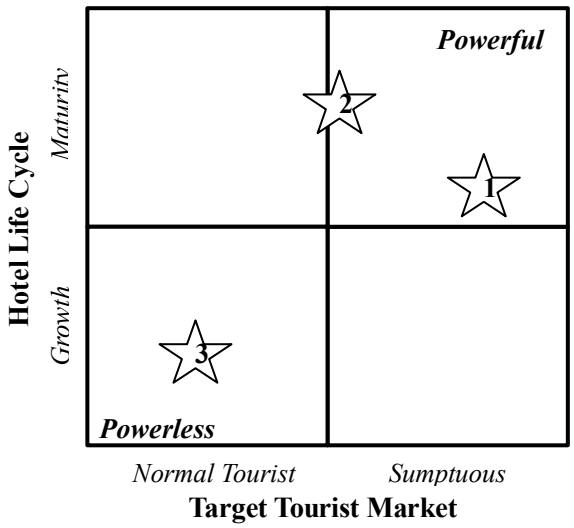

Fig. 1. The Life-Target Matrix

A *growth phase* means that hotels are new, and do not have the stable market share and tourist target, a *maturity phase* means hotels have a long history, and have the stable market share, fame, distribution channels and tourist target. The horizontal axis of Target Tourist Market refers to the hotel's target market, from normal tourists to sumptuous tourists. For example, the following described hotels are sumptuous hotels in maturity: Star 1 hotels represented by Burj al Arab Hotel, Dubai (http://www.dubai-burjalarab.de/), Star 2 hotels represented by Hilton Hotel, USA (http://www.hilton.com/), and Star 3 hotels represented by StarWorld Hotel, Macau (http://www.galaxye- ntertainment.com/).

Considering the both factors of hotel life cycle and target tourist market, the Life-Target Matrix can be divided into four cells, where each indicates a particular type of hotels.

Growth-Normal Cell. This cell indicates hotels, which are in growth phase and aim at normal tourist market. Comparing with other hotels, they have high level of electronic management skills and apply modernistic management methods, but they are not famous and do not have stable tourist target, they need an Internet platform to distribute and promote their hotel products, and eager to raise their renown. These hotels are powerless [9].

Growth-Sumptuous Cell. This cell indicates the sumptuous hotels, which aim at sumptuous tourists. When these hotels select the distribution channels and promotion approaches, they often consider their brand equity and status, and also much care to raise their renown. Usually, they have the specialized promotional channels, and may not be enthusiastic about joining any common hotel information platforms [8].

Maturity-Normal Cell. If a hotel aims at normal tourists, and has a long history, then it should be in Maturity-Normal cell. Often, these hotels' management methods are traditional, but they have the stable market share and tourist target with a great renown. Concerning the risk of investment, they may not be enthusiastic about joining in any platforms [9][10].

Maturity-Sumptuous Cell. This cell describes hotels, which aim at sumptuous tourists. They have a long history with stable market share, specialized sale channels, traditional styles of management, and great renown. This type of hotels is most difficult to be attracted to join in any existing hotel information systems, and can be classified into the powerful hotels [7][8].

Given various situations in the Life-Target Matrix, hotel service providers are able to make hotel information integration policies that apply to different types of hotels.

III. Hotel Information Integration Policies

A key success of hotel information platform is to attract more hotels to join in but to control the cost of participation in a tolerable level. Thus, hotel service providers should balance the cost and benefit in making integration policies. To achieve this balance, a policy matrix, called *Technology-Promotion Matrix* shown in Fig. 2, is devised to make specific policies on different types of hotels specified in Life-Target Matrix.

Policy for Growth-Normal Cell. Hotels in this cell is powerless, so it is much possible for hotel service providers to cut the cost of integration through certain *self-service policy*. With this guideline, it is feasible to apply an economically technical solution by only providing standard connection port and protocol to the hotels. More specifically, the designed platform only supports port protocols where hotels submit information by themselves through the automatic or collaborative services. Using this policy, the integration cost of service providers can be drastically reduced.

Policy for Growth-Sumptuous Cell. For the hotels in this cell, hotel service providers can provide standard connection port plus a specific policy adaptable to them. Since these hotels are newly born, they are eager to promote their products and raise renown. Nevertheless, their target customers are sumptuous tourists. These drive them to specific promotional techniques and marketing channels. In this sense, while standard services should be provided as the same for the hotels in growth-normal cell, the policy of ensuring high security and privacy must be additionally carried out in this cell.

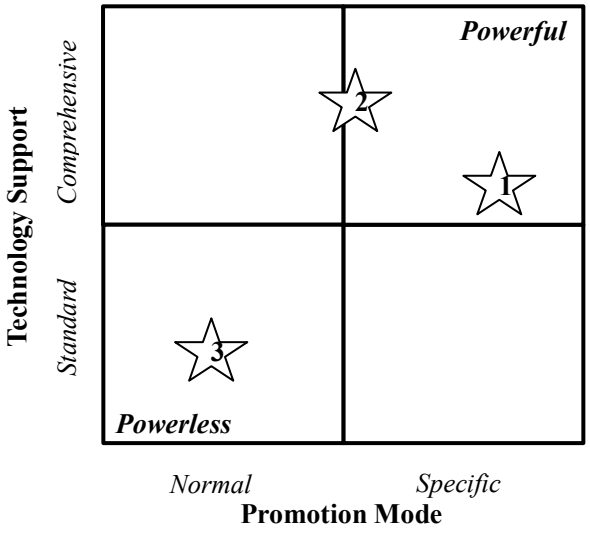

Fig. 2. The Technology-Promotion Matrix

Policy for Maturity-Normal Cell. Hotel service providers can make the policy of supporting the hotels in this cell by providing the specified and supported connection port to hotels from the service provider's hotel information systems. This policy is attractive because it can both cut the connection cost of service providers and reduce the investment risk of hotels. Hotels will find that the policy is cheaper to be implemented for keeping a routine sales outlet with the assured integration service support. Under this policy, service providers will pay the service support for resolving integration problems that may occur. The philosophy behind this policy is that the renowned hotels with long history will be a long-term customer, and is thus worth sharing service cost with them.

Policy for Growth-Sumptuous Cell. The hotels of this cell are the most powerful. They are well-known with fame, reputation and stable market. These hotels are the important customers of hotel service providers and are an important concern in designing platform of hotel information integration. It is necessary to attract them to join in the service providers' systems. A policy can be made to support the hotel information integration into service provider's systems by means of service provider bearing the integration cost if the cost-benefit analysis is feasible. The basic idea behind this policy is that powerful hotels can bring service providers long-term benefits.

The Technology-Promotion Matrix, showed in Fig. 2, has presented the exact policy for each hotel type. It can be used to guide the design of hotel information integration systems that attract more hotels and control the cost of integration. In the next section, a hotel information collaboration platform will be designed to support all the integration policies described here with the characteristics of flexibility and accuracy for information exchange between hotels' information systems and the hotel service provider's hotel information service system.

IV. Hotel Information Collaboration Platform

CODEX (Collaborative Documents Exchange) [3] is an approach for maintaining semantic consistency between the exchanged business documents of any two autonomous business communities, where the documents sender and receiver have no misunderstanding in using the exchanged documents.

Following the CODEX design principle, this paper proposes the Hotel Information Collaboration Platform (HICP) illustrated in Fig.3. The HICP attempts to maintain the semantic consistency of the exchanged hotel information between hotels' information systems and the service provider's hotel information service system. It includes four layers of Messaging, Structure, Concept, and Collaboration.

Message Layer. This layer is responsible for sending and receiving collaborative messages. In HICP, we adopt standard SOAP as the mandatory message envelope for exchanging HICP' collaborative operation documents and hotels' reified product documents.

Structure Layer. Structure is a container of meaningful concepts. It is similar to schema, but it itself has no meaning

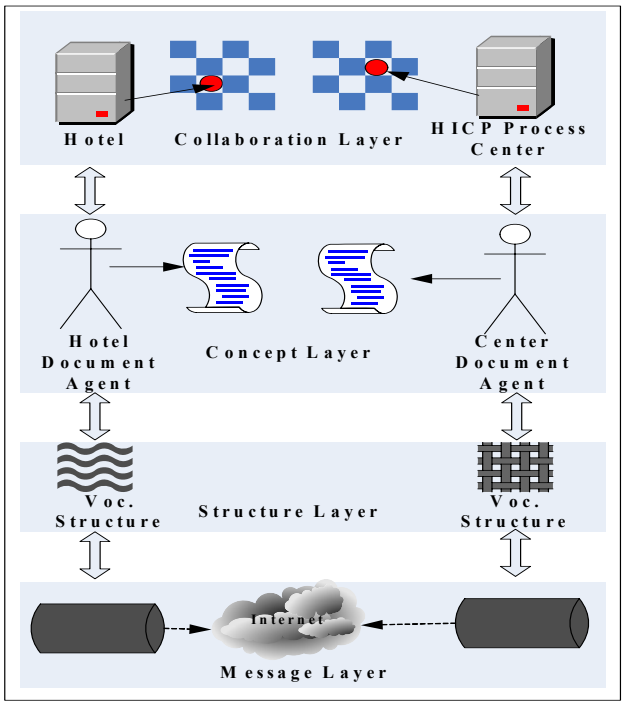

Fig. 3. HICP Framework

and is only a data representation structure. If there is no structure to be shared or mapped between hotels and HICP, meaningful concepts have nowhere to be conveyed and mediated between parties. In HICP approach, we adopt XML Product Map (XPM) Schema as the structure for hotel product concept generation.

Concept Layer. This layer is a concept storage component, recording the hotel product concepts agreed between collaborative parties in XPM schema vocabulary with its simplified sample shown in Table Ⅰ.

TABLE Ⅰ XPM Concepts (Simplified)

```
<concept xpm:iid=" h.51.33" xpm:an="Hotel catalog" >
 <concept xpm:iid="h.51.33.1" xpm:an="Hotel Name" >
  <concept xpm:iid=" h.51.33.1.1" xpm:an="Room Type" />
  <concept xpm:iid=" h.51.33.1.3" xpm:an="Price" >
   <concept xpm:iid=" h.51.33.1.3.1." xpm:an="Currency" />
   <concept xpm:iid=" h.51.33.1.3.2" xpm:an=" Unit Price" />
  <concept xpm:iid=" h.51.33.1.3.3" xpm:an="Unit" />
</concept></concept>
```

The example shows a category of hotel concepts mutually agreed and recorded by collaboration mechanism as a common product vocabulary between hotels and HICP, and it is the precondition of further collaboration between them.

Collaboration Layer. This layer is a collaboration mechanism enabling collaboration between hotels' information systems and HICP. Fig. 4 is the architecture diagram of this layer, which consists of the following types of components:

- Two types of hotel electronic product catalogue (EPC): the CEPC that stores the common hotel product concepts created by hotel service providers, and the LEPC that stores the local hotel product concepts personalized from CEPC.

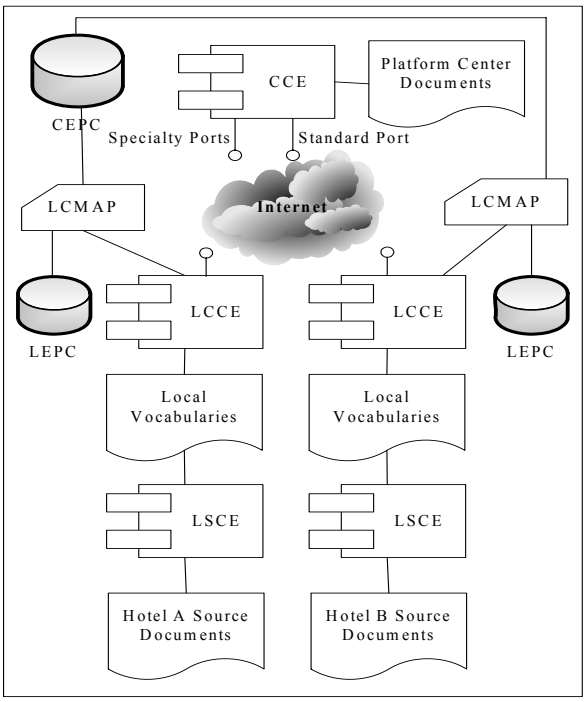

Fig. 4. Architecture of Collaboration Layer

- One type of collaborative concept map (MAP): LCMAP (e.g. given LEPC L.15.1←name, CEPC C.22.3.1←name, then LCMAP (L.15.1, C.22.3.1)).

- Three documents: Hotel Source Documents, Local Vocabularies and Platform Documents. Local vocabulary should include all the terms that have been used in all hotel source documents. For powerless hotels, there is no problem because all hotel source documents will be built using given hotel document templates that may localize. For power hotels, the first process should gather these hotels' existing source documents and analyze whether their terms used in source documents have already included in CEPC. If not, the CEPC should be expanded similar to the process of globalization. But here in fact the hotel service providers do it actively by themselves.

- Three collaboration engine: Local-Source Collaboration Engine (LSCE), Local-Center Collaboration Engine (LCCE) and Center Collaboration Engine (CCE).

- Two ports: Specialty Port and Standard Port. The *Specialty Port* is designed for some powerful hotel, and the *Standard Port* is designed for powerless hotel to connect. The purpose of standard port design is to provide a low cost and simple technology solution to support the business policy. Its target users are powerless hotels. It includes Outside Collect Port and Outside Notify Port. The *Outside Collect Port* is used for receiving data from hotel systems, and the *Outside Notify Port* is used for sending data to hotel systems. The port includes two kinds of parameters, protocol parameters and business parameters. Protocol parameters like service name, partner id, verify code and other parameters should be used. Business parameters like comiid and value.

This part illustrated the framework of HICP, in the next part we will explain the features of HICP, why it can support the business policies and how powerful and powerless hotels can be served.

V. Features of HICP

Our main perspectives of business policies on hotel information integration are accuracy and flexibility. Firstly, like CODEX system [3], HICP focuses on collaborative integration, which has resolved the semantic consistency issue through collaborative concept mapping, which cannot be solved in ontology mapping approach. Second, HIPC presents the feature of business flexibility. The document structures of HICP are modeled based on the layered design thought. These models enable heterogeneous document concepts to be autonomously created but be uniquely identified and aligned through collaborative concept map structures. They resolve the flexibility issue of document standard approaches, where identifiers of document elements are rigidly predefined In addition, the HICP is designed based on CODEX design principle, which clearly separates knowledge schemas from the concepts conveyed in the schemas. This separation detaches the design of system structures from the design of business concepts, and makes the semantic integration task easier to be accomplished. In the complex semantic environment of hotel industry, it can solve the integration issue of heterogeneous documents in hotel industry, which is comparatively much harder for other ontology integration approaches. The derived features of this is that HICP has better document compatibility with local documents of hotels, higher expandability of the systems and easier to maintain the whole integration systems.

Another feature of HICP is variability. The HICP platform provides various types connection models with regard to the integration policies set on the hotels. Based on the two raw types of connection port design for powerful and powerless hotels and the open protocol of CODEX and XPM, various connection modes can be developed to match different hotel supplier business processes. For example we can design B/S or C/S connection interfaces if the business policy need.

HICP enables the accurate document exchanges between hotel systems and HICP systems, because the concepts created and edited in heterogeneous contexts are accurately maintained their semantic consistency, and accurately reflect the exact understanding of concept designers. For example, in the creation of a concept "Hotel", if role 1 uses concept "Hotel" while role 2 uses concept "Ertel", it is difficult to confirm that these two concepts all refer to "Ertel". However, if they use the collaboration mechanism, they may communicate and discuss with each other to resolve the semantic conflict between "Hotel" and "Ertel".

VI. Related Work

Information integration is important in constructing hotel e-commerce, while many researches have done previously, the task of integration and the mechanism of maintaining semantic consistency are still not well known.

In addition to the hotels and their supply chains, the operations that distribute hotel rooms include global

distribution systems (GDSs), distribution service providers (DSPs), third-party websites (e.g., Expedia, priceline.com), and traditional travel agencies [5]. HICP belongs to third-party website. For this kind, most of the existing platforms still use telephone, email and fax to exchange product and booking information with hotels. Newer representatives of technology development of this kind can be concluded to the following two: Expedia Quick Connect (EQC) system developed by expedia.com [11], and ez Hotel Management System(ezHMS) [12] developed by Tsinghua Tongfang Co. Ltd. Through a brief introduction of these two systems, we compare their platform differences with newly proposed HICP in Table 2.

Expedia is the biggest tourism electronic agent but initially most of its business with hotels partners was still using the traditional information communications. To change this situation, the company developed the EQC system. According to Expedia.com, connectivity allows for the electronic exchange of rates, inventory and booking data between Expedia.com and its hotel partners.

Tsinghua Tongfang Co. Ltd, is a well-known information technology solution provider. Based on Software-as-a-service (SAAS) approach, they developed the ezHMS platform. The model is: the hotels rent ezHMS software, and all the software operations and hardware servers are operated on Internet but owned by Tsinghua Tongfang Co.Ltd. In this model, hotels do not need to buy hardware and software.

TABLE Ⅱ Comparison Among HICP, EQC, ezHMS

Features	HICP	EQC	ezHMS
Main Technology	XPM	XML over HTTPS	J2EE
Information Integration	Whole	Part	Whole
Business Flexibility	High	Medium	Low
Acceptability	Low	High	Medium
Variability	Yes	No	No
Connection Cost	Medium	High	Low
Accuracy	High	Medium	High
Compatibility	High	Medium	Low
Expansibility	High	Medium	Low
Maintainability	High	High	Low

Table Ⅱ provides a comparison between the platforms of EQC, ezHMS and HICP. The comparison shows that HICP has advantages in business flexibility, variability, information accuracy, compatibility, expandability and maintainability.

VII. CONCLUSION

This paper has proposed a hotel power policy approach to integrating online hotel information systems. This approach is based on the newly created theory of hotel power that guides to segment the market of hotels in a Life-Target Matrix. This Matrix divides tourist market into normal and sumptuous markets with two different hotels lifecycle stages of growth and maturity. This division can help platform managers to identify and group the various hotel partners, and then establish correct policies for each group of hotel partners. Based on this division a Technology-Promotion Matrix is further developed for hotel service providers to make correct online hotel information integration policies. These policies are implemented in a hotel information collaboration platform (HICP) with features of flexibility, variability and accuracy. This platform includes 4 layers: message layer, structure layer, documents layer and collaboration layer. This platform can solve the issue of semantic integration and the numerous hotel participations with variable connection requirements.

Major contributions of this paper includes (1) a theory of hotel power, (2) a Life-Target Matrix for segmenting hotel market, (3) a Technology-Promotion Matrix for making integration policies on different types of hotels, and a HICP platform for implementing integration policies.

Hotel information integration policy approach presented in this paper is still evolving. More stringent business model development and technology implementation level evaluation of this approach is required based on the future research. Due to HICP only providing a framework, future works would be proposed towards the specific designs of collaboration component design such as port detail design.

ACKNOWLEDGEMENT

The work reported in this paper has been partially supported by University of Macau Research Grand.

REFERENCES

[1] Alamdari, F., "Regional development in airlines and travel agents relationship", *Journal of Air Transport Management* 8(5), 2002, 339–348.

[2] Guo, J., "EM2I: A Term in Search of the Infrastructure of Electronic Markets", in: *IFIP Series*, Springer (2007) (to be appeared).

[3] Guo, J. "Inter-Enterprise Business Document Exchange", in: *Proc. of the 8th Int'l Conf. on Electronic Commerce*, ACM Press (2006), pp. 427-437.

[4] Werthner, H. and F. Ricci, "E-commerce and tourism", *Communications of the ACM* (47)12, 2004, pp. 101-105.

[5] Carroll, B. and J. Siguaw, "The evolution of electronic distribution: effects on hotels and intermediaries", *Cornell Hotel & Restaurant Administration Quarterly* 44, 2003, pp. 38-50.

[6] González, M. "Application of information technologies in the commercialization and management of tourist products and destinations, in intermediate regions: reticular integrated strategies", in: *Proc. of the winter int'l sym. on Information and communication technologies*, Cancun, Mexico, 2004, pp. 1-6.

[7] Catrett, J. and Lynn, M., "Managing status in the hotel industry: how Four Seasons came to the fore", *Cornell Hotel & Restaurant Administration Quarterly* 40, 1999, pp. 26-39.

[8] Bernstein, L., "Luxury and the hotel brand: art, science, or fiction?", *Cornell Hotel & Restaurant Administration Quarterly* 40, 1999, pp. 47-53.

[9] Kotler, P., Bowen, J. and J. *Makens, Marketing for Hospitality and Tourism*, 3rd ed, Pearson Eduction, Inc., 2003, 539-629.

[10] Lamb, C., Hair, J., and C. McDaniel, *Marketing*, 6th ed, 469-570.

[11] Expedia, *Expedia Quick Connect system*, http://www.expediaquickconnect.com, accessed on 23rd June 2007.

[12] ezHotel Management System(ezhms), http://www.ezonesoft.com.cn/hotel/index.htm, accessed on 23rd June 2007.