

# Chapter 12

## Hospitality Curriculum Reform with the Integration of Big Data Technology for Bachelor Program in China Mainland and Taiwan: Exploration of the Stakeholders' Perspectives



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**Abstract** Big data technology has expedited the curriculum reform for hospitality undergraduates in 4-year bachelor program since it brings innovations to the daily operation in hotel industry. This paper conducts a deep interview on four types of experts from the mainland of China and Taiwan with aims to primitively understand how big data technology is applied on and integrated into the hospitality curriculum reform. The competence positioning, input resources and the scope of course applied with big data are included in the dimensions of curriculum reform. Relevant categories and items reflect the stakeholders' views from four types of experts. Theoretical and practical suggestions are thus offered to provide reference for big data course building in hospitality curriculum.

**Keywords** Big data · Hospitality curriculum for bachelor program · Expert interview · Course building

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## Introduction

Big data technology is generally defined as an emerging technology of processing and analyzing a huge volume of real-time data and big data is featured with five V's dimensions (i.e. Volume, Variety, Velocity, Veracity and Variability) (Gandomi & Haider, 2015). Its methods are gradually applied in hotel and tourism industry during these 5 years. The issues on the application of big data in hospitality are mainly focused on customer behaviours like accommodation experience (Barnes et al., 2020), brand recognition (Giglio et al., 2020), customer satisfaction (Jia, 2020), attributes of customer preference (Cheng and Jin, 2019) and etc. Prior studies of hospitality education within three years were lacked in the area of big data-oriented curriculum reform. Only a few researchers mentioned conceptual suggestions for big-data integrated with other courses like Human Resource Management (HRM) or validated the influence of big data on tourism/hospitality (Adeyinka-Ojo et al., 2020; Martin-Rios et al., 2017; Ogbeide et al., 2020).

As for the big data teaching practice in hospitality curriculum, some hospitality and tourism schools in Taiwan (e.g. National Kaohsiung University of Hospitality and Tourism or NKUHT, and National Chiayi University or NCYU) have introduced big data workshops for students and faculty or added the big data course as selected course into curriculum. In order to respond to big data course building, several universities have launched the constructions of big data experimental labs for Master program of Tourism Administration. However, so far there are very few hospitality or tourism schools that have an overall development for big data course, which demonstrates the related teaching is lag behind the industrial application and academic researches.

Given the lack of systematic exploration on how to integrate the big data content into hospitality courses in curriculum reform, the hospitality education community are in urgent need of finding out the possibility and feasible ways of integrating the big data content into the hospitality curriculum in 4-year bachelor program. In the following sections, the authors briefly review on both academic and educational research of big data in hospitality. Then the dimensions, categories and items on three interview questions are explored from different stakeholders' views. The conclusions also provide practical and theoretical foundation for big-data-oriented course integration in hospitality education.

## Literature Review

### *Academic Research of Big Data in Hotel Management*

Big data is defined as a very large set of structured and unstructured data (De Mauro et al., 2015). Gandomi and Haider (2015) classified five definitions of big data based on an online survey of 154 global executives to show how differently the executives

understand on the definition of big data. 28% of executives acclaim big data represents massive growth of transaction data, including data from customers and the supply chain. 24% of them think big data is new technologies designed to address the volume, variety, and velocity challenges of Big Data. 19% of them regard big data as a requirement to store and archive data for regulatory and compliance. 18% of them explain big data to be explosion of new data sources (i.e. social media, mobile device, and machine-generated devices) (Gandomi & Haider, 2015). In practice of hotel big data application, collecting and analysing big data from supply chain, service encounter, online review and transaction records are typical areas applied with this technology. Many hotel management and owners have witnessed product design, sales predication and service satisfaction optimization are enhanced by applying big data technology (Pan & Yang, 2017; Zhao et al., 2019).

Most of related researches published in the recent 3 years see big data technology as a method of data collection and apply it on exploration study of accommodation experience, satisfaction, customer profiling, brand cognition as well as other empirical studies. On exploring employee-tourist encounter experience value, Barnes, Mattsson, Sørensen and Jensen (2020) tested the model and revealed the importance of the factors for leveraging perceptions of satisfaction, service and value using a large sample of hotel review text crawled by big data technology. Likewise, the big data analysis shows that location, amenities and host as three key attributes are influencers on Airbnb accommodation experience (Cheng & Jin, 2019). In the area of hotel brand cognition, the big data method also improves the preciseness of results to identify what impact the experience of staying in luxury hotels from the perspective of customer by crawling visual data online, further support to transform the insights into brand experience, and improvements in luxury hotel brand communications (Giglio et al., 2020). Another big data application area is CRM. Efficient client profiling is addressed through big data analysis on large amounts of available information in the Customer Relationship Management (CRM) systems (Talón-Ballesterero et al., 2018).

### ***Education Research of Big Data in Hotel Management and Other Business Area***

To date, there are very few researches concerning the combination of the hospitality curriculum and big data. On discussing the possibilities that hospitality/tourism curriculum can be integrated with big data, Ogbeide, Fu, and Cecil (2020) pointed out the difference in competence positioning between data analyst and hospitality/tourism data analyst, thus a better method for establishing a program should combine the data-oriented skills with hospitality and tourism domain skills. Some researchers conducted a content analysis on related literature to explore the role of digital literacy and employability skills influencing hospitality operations. Moreover, they have identified the areas that big data technology would be integrated with

hospitality innovation and employability skills include AI, service robot, cloud computing, social media tools, mobile Apps, Google Analytics and Property Management System (PMS) Operations (Adeyinka-Ojo et al., 2020).

In terms of a specific hospitality course, big data content can be an updated addition to hospitality human resource management (HRM) teaching as well. For instance, students learn to leverage new technology and new HRM metrics in a teaching case where the strategic dimensions of HRM are combined with practice-driven data analysis anchored in HR analytics and HR big data mining. The results show HRM course integrated with big data teaching content will make students easier to identify, develop and improve managerial skills (Martin-Rios et al., 2017).

Most literature has merely discussed establishing information curriculum integrated with big data technology. A very few numbers of education research studies paid attention to interdisciplinary combination between big data course and other business curriculum. There is one exception paper toward integration of Big Data, technology and information systems competencies into the accounting curriculum. Which come to conclusion that accounting competencies, foundation competence and broad management competencies are leveraged and available teaching resources are elicited in the process of course integration with big data technology (Sledgianowski et al., 2017). However, there is a distinct void in prior education study on combination of big data with hospitality curriculum in bachelor program. Thus, our three objectives are to attempt to make clear: first, what the competencies are positioned when integrating big data content into the hospitality curriculum? second, what kinds of teaching resources are indispensable for big-data-oriented hospitality curriculum? and finally, what courses can be applied with big data content and what are possible methods for integrating big data into hospitality curriculum?

## Method

### *Expert Interview*

The expert interview, developed considerably since the early 1990s, has been widely recognized as a method of qualitative empirical research. Designed to explore expert knowledge, the expert interview is another qualitative method to collect data from expert source and conduct a content analysis on these data (Dai et al., 2020; Meuser & Nagel, 2009). When planning the hospitality curriculum reform, a dearth of scholars and educators have adopted the expert interview to explore the innovative perspectives. Through expert interview on 11 hospitality and tourism program directors in Asia, the strong role of industry stakeholder on curriculum design is identified and the issues such as objectives of the programs, graduate competencies, the subject material and accreditation are also discussed in regional comparison between Southeast Asia and East Asia (Oktadiana & Chon, 2017). Another example

is examining hospitality industry managers' perspectives on sustainability in education by in-depth interviews with 11 managers in Northern California. These expert interviews show sustainability will be a new standard in the hospitality, further providing a robust evidence to incorporate it into the hospitality curriculum (Millar & Park, 2013).

The previous expert interviews on hospitality education demonstrate that experts consist of school educators, hospitality managers, technical specialists or combination of three stakeholder identities above. Followed the theoretical sampling to select the interviewees, the reliability and validity of interview on multi-stakeholders is much stronger than another single stakeholder interview. In line with the research objectives, the interview questions unfold as follows. First, what are the competencies positioning for hospitality undergraduates in the process of integrating big data content into hospitality curriculum? Second, what the essential resources are input into big data-oriented hospitality courses? and finally, what hospitality courses can be integrated with big data technology? And what methods are effective to realize these integrations?

### *Data Collection*

Data collection was undertaken from December, 2020 to February, 2021. Utilizing their social and academic connections, the researchers adopted snowball sampling to recruit 12 experts for interview, who are working as hospitality teacher (HT), big data teacher (BDT), hospitality managers (HM), big data engineer in hotel industry (BDE) or both. Due to the fact that the hospitality teaching faculty of mainland of China and Taiwan comes from related trades, most of experts have combination of these four identities mentioned above, proving the qualifications of working experience these experts possess for interview. The profiles of experts can be seen in Table 12.1.

Considering the social distancing impacts of COVID-19, the researchers conduct a video interview for each expert via WeChat or Facebook Messenger. The time for each expert interview was limited in the range of 30–45 min. The researchers raised the three interview questions for experts while recording the answers the experts gave. Besides, the ambiguous or oversimplified answers from experts were clarified or elaborated in more details, which ensure the content depth and accurateness (Patton, 1990). After completing all interviews, the researchers manually transformed and double-checked the verbatim transcripts from the auditory recording.

**Table 12.1** Profile of experts participating in an interview

| Respondent | Category of stakeholder | Education | Work experience (in year) | Country/Region |
|------------|-------------------------|-----------|---------------------------|----------------|
| R1         | BDT                     | PhD       | 29                        | TW             |
| R2         | HT                      | PhD       | 8                         | TW             |
| R3         | BDT, HT                 | Master    | 15                        | CN             |
| R4         | BDT, HT                 | Master    | 6                         | CN             |
| R5         | BDE                     | Bachelor  | 25                        | CN             |
| R6         | BDE, HM                 | Master    | 12                        | TW             |
| R7         | HT, BDT                 | PhD       | 30                        | CN             |
| R8         | BDE, HM                 | Bachelor  | 12                        | CN             |
| R9         | BDE, HM                 | PhD       | 10                        | CN             |
| R10        | BDE, HM                 | Bachelor  | 12                        | CN             |
| R11        | HM                      | MBA       | 30                        | CN             |
| R12        | BDT, HT                 | PhD       | 5                         | TW             |

Source: developed by the authors, 2020

## *Data Analysis*

The researchers applied ground theory on categorizing the transcripts by three steps of open coding, axial coding and selective coding. In the process of coding steps, a set of three answers from every expert were completely verified in the regard of consistency. Then items, categories and dimensions are gradually selected based on the principles of categorization. All the values for the inter-rater reliabilities exceeded the threshold value of 0.8 (Kassarjian, 1977; LeBreton and Senter, 2008). With purpose of guaranteeing the validity of data analysis, the processing of meaningful units followed triangulation which contributes to reduce the bias of coding and decoding. Generally speaking, the triangulation is applied in such situation: when the two researchers are unable to reach the consensus on a specific categorization, the third researchers will get to examine and give final evaluation which categories and dimension will the items are classified into (Dai et al., 2020; Patton, 1990).

## **Results**

### *Competencies Positioning*

For the first question, two dimensions coded from the expert transcripts are identified as: (a) Big data analytical competence and (b) Big data processing competence. Many experts acclaimed that hospitality undergraduates are not possessed with information data analytical foundation. Nevertheless, the programme objectives required graduates to have the analytical capabilities for existing data sets. For this reason, the students should put big data analytical competence as priority on the premise that they are quite familiar with the background knowledge of hotel

operations. The majority of experts prefer to emphasize the analytical competence rather than processing competence on the basis that the students have a good knowledge of operational routines, strategies and situations applied with big data technology. According to the frequency statistics, big data analytical competence the students must grasp include operational competence, strategic competence, processing competence, creative competence and framing competence in descending order. Another dimension is big data processing competence which comprises two competencies of data crawling and data cleansing (see Table 12.2).

In the dimension of big data analytical competence, 5 categories are referred in expert interview as (1) *Operational competence*. This competence requires students

**Table 12.2** Dimension, categories, items and frequency for Big data competence positioning

| Dimension                      | Categories  | Item   | frequency |
|--------------------------------|---|--|-----------|
| Big data analytical competence | 1. Operational competence                             | Revenue mgt.   | 12        |
|                                |   | AI application   | 11        |
|                                |   | Divisional resources flow  | 10        |
|                                |   | Product& service portfolio   | 9         |
|                                | 2. Strategic competence                               | Pricing  | 12        |
|                                |   | Sales strategy   | 11        |
|                                |   | Promotion channel  | 9         |
|                                |   | Inventory management   | 7         |
|                                | 3. Processing competence with basic report data       | a. Mastering the basic statistics knowledge                          | 9         |
|                                |   | b. Grasping the competence of basic data processing with excel\ SPSS | 8         |
|                                | 4. Creative competence for hospitality business mode  | Understanding thinking change for hospitality operation              | 8         |
|                                |   | Understanding thinking change for hospitality service                | 7         |
|                                | 5. Framing competence for big data application fields | AI operation   | 6         |
|                                |   | AI service   | 5         |
|                                |   | AI engineering   | 3         |
| Big data processing competence | 1. Data crawl competence                              | a. Use Python or R program to crawl the data                         | 5         |
|                                |   | b. Use another software to crawl the data                            | 4         |
|                                | 2. Data cleansing competence                          | a. Batch processing with specific software                           | 5         |
|                                |   | b. Data wrangling with Python  | 5         |

Source: developed by the authors, 2021

use big data flow to analyse revenue performance, AI application effects, resource flows and product and service portfolio. (2) *Strategic competence*. Pricing, sales strategy, promotional channel and inventory management are the main areas that apply big data-oriented strategic competence. (3) *Processing competence with basic report data*. This competence calls for the basic statistics knowledge and the competence of basic data processing with Excel and/or SPSS, which students must handle this prerequisite knowledge. (4) *Creative competence for hospitality business mode*. This is high ranked competence for hospitality students in bachelor program. Most experts suggested students should understand that hospitality operation and service have been changed with the trend that big data technology will change the business mode to be more data-science sensitive than merely relying on rule of thumb. And (5) *Framing competence for big data application fields*. Students are asked for to know how to frame big data application fields and make sense of the big data technology in hospitality management. So far it is not feasible for students to think of comprehensive application with big data. However, experts recommended the three domains that use big data is AI operation, AI service and AI engineering in hotel industry.

In the dimension of big data processing competence, experts acclaimed that students majored in hotel Information Technology (IT) management should master basic big data crawling and cleansing. Two approaches for students to deal with crawling and cleansing are: (1) to employ R or Python programming; and (2) to use other localized crawling tools. However, since numerous websites are anti-crawling, thus students with IT career plan must learn the basic crawling and cleansing programming with R or Python. All these viewpoints can be seen in the following excerpts:

Our positioning for cultivated the hospitality students' competence is mainly focused on analytical competence with big data, rather than processing competence. Due to their career requirements in hospitality, the big data are often processed by the IT specialists, what they need to do is to read the data precisely with their hotel operational background (R7).

### ***Teaching Resources Input***

All experts mentioned teaching faculty, teaching facilities and big data source are three dimensions of teaching resources input into hospitality big data course (See Table 12.3). The methods of qualifying teaching faculty are divided into three categories (i.e. introducing faculty specialized in big data, inner training, and co-teaching) with IT manager in hospitality industry. Since most hospitality schools have established the cooperated networking of hotels for student internship, teaching faculty for big data courses can be found by introducing IT managers or trainers in the first step. By cooperated teaching with IT managers or trainers, the hospitality teachers have more chance to update their knowledge of industrial status quo and accumulate teaching experience for hospitality big data. This cooperated teaching practice can enhance integration level of the hospitality courses with big data. But



**Table 12.3** Dimension, categories and frequency for resources input into Big data--oriented hospitality courses

| Dimension                        | Categories  | frequency |
|----------------------------------|---|-----------|
| Qualifying teaching faculty      | 1. Co-teaching with IT manager in hospitality industry              | 12        |
|                                  | 2. Introducing faculty specialized in big data                      | 10        |
|                                  | 3. Inner training   | 7         |
| Constructing teaching facilities | 1. Purchasing revenue Mgt. Software                                 | 11        |
|                                  | 2. Purchasing Opera PMS   | 11        |
|                                  | 3. Purchasing Restaurant & Catering Management Software like micros | 8         |
|                                  | 4. Set up reservation apps  | 6         |
|                                  | 5. Simulation software or ERP                                       | 5         |
| Updating the big data base       | 1. Purchasing the real data from business data company              | 9         |
|                                  | 2. Acquiring open data from NGO or local government                 | 10        |
|                                  | 3. Obtaining local data from hotel                                  | 3         |

Source: developed by the authors, 2021

if the curriculum is in urgency to cover data course, introducing new teacher directly is more preferred among expert's opinions and inner training is the last choice since it's more time-consuming.

In terms of constructing teaching facilities, a lot of experts have mentioned five categories, which refer as purchasing software on revenue, PMS, restaurant & catering and setting up Apps or simulation software. All experts emphasized that purchasing the education version of hospitality software is essential for students to simulate data operations. For instance, ten experts have recommended the Sales Module of OPERA Cloud Property Management or Micros to be a terminal to acquire real-time data from hotel members and conduct simulated big data case for students. Based on the big data analysis of preferred customer portfolio, the students can deeper understand the logics of making pricing and sales strategy. Several experts hold that big data can be acquired by booking Apps or WeChat mini program as well. While a few BDEs and HMs suggested Cesim ERP or simulation software such like Hiyield would be an alternative, a majority of experts still insist that purchasing the education version of main hospitality software be a once-for-all option.

All experts indicated the big data base needs to update once teaching facilities have been installed. At present, the data have been preset by suppliers or compiled by teachers when teaching software was purchased. Most of experts assumed the big data for hospitality teaching is not actually "big data" due to the fact teaching data was often sourced from a single hotel in a case study. However, the interviewed

experts tended to define hospitality big data in teaching as comparative big data sourced from all members of a specific hotel brand or a regional hotel industry. The volume of these data is qualified as relatively small sample for big data set, thus functioned as “big data” base for teaching purpose.

The big data base for teaching should be updated through three ways. (1) *Purchasing the real data from Business data company*. Many experts have referred STR data service as a reliable option because of STR profession for hospitality data collection and analysis. (2) *Acquiring Open data from NGO or local government*. Regional hotel associations or tourism bureaus in mainland of China and Taiwan regularly conduct hospitality statistics as a main task of official data collection. According to the practical routine, the open data needs to be verified and corrected by teachers for the reason that official data may be distorted when hospitality is in time of depression. (3) *Obtaining local data from cooperation hotels*. Students feel more familiar with local hospitality operation and get a sense of accomplishment when dealing with local data. Therefore, some experts preferred to obtain local data functioned as big data set in order to increase teaching effects. Relevant comments are provided in the following remarks:

The most important thing we must consider is to introduce teaching faculty that specialized in Big data. If the hospitality teacher and big data teacher can cooperate to open related course, it would be much better for teaching teamwork (R1).

Buying software just wants sufficient fund for purchase while how to update real big data source is a concern (R6).

The data we input should be real data from hospitality. Besides accessing to data from STR, the lecturer must ensure the big data is about the region students are located. So, students will feel their research assignment is more local contextual and connected with target to serve the local industry (R12).

### ***The Scope of Courses Applied with Big Data and the Methods of Building Big Data Course***

In the view of the fact that big data courses are offered in very a few hospitality schools with 4-year bachelor program, experts shared their opinion based on their own expertise, teaching and training experience in order to identify what courses are fit for integration with big data technology. The scope of courses is listed as Hotel Marketing, Revenue Management, Opera PMS Management, Human Resource Management and Hotel engineering & inventory Management (See Table 12.4).

In the teaching content of Hotel Marketing, big data technology is mainly applicable on online review and word-of-mouth (WOM) management of hotels, online ads effects, online travel agency (OTA) cooperation and channel selection, online service & product portfolio and CRM. All types of experts believed the guiding role of big data analysis on online review and WOM. If the teachers develop more new cases concerning online review monitoring, students get a better understanding of

**Table 12.4** Dimension, categories, items and frequency for the course scope applied with big data

| Dimension                              | Categories   | Items   | frequency |
|--|--|---|-----------|
| Types of courses applied with big data |  |   |           |
|  | 1. Marketing   | a. Online review & WOM  | 12        |
|  |  | b. Online advertising effect  | 10        |
|  |  | c. OTA selection  | 10        |
|  |  | d. Online product portfolio   | 9         |
|  |  | e. CRM  | 8         |
|  | 2. Revenue management                                      | a. Big data analysis on sales performance and indexes   | 12        |
|  |  | b. Commission management  | 9         |
|  | 3. Opera PMS operation                                     | a. Get access to updated big data   | 10        |
|  |  | b. Understand the hotel operation through Opera PMS and identify the data source from various flows | 9         |
|  | 4. Human resource management                               | a. Personnel recruiting   | 6         |
|  |  | b. Staffing management  | 6         |
|  |  | c. HR outsourcing   | 3         |
|  | 5. Engineering & Inventory Management                      | a. Inventory cost control   | 5         |
|  |  | b. Purchasing management  | 4         |
|  |  | c. Energy control   | 4         |
| Method for course opening              | 1. Open new course of big data in hospitality              |   | 11        |
|  | 2. Open workshops of big data in hospitality               |   | 7         |
|  | 3. Supplement existed courses with the content of big data |   | 6         |

Source: developed by the authors, 2021

the power of big data integrating with hotel reputation management. Both HMs and BDEs pointed out the online marketing effects of hotel are measured with the items about the online ads' effects, the performance of different OTA channels, online accommodation portfolio and CRM. These items, as experts mentioned, can be assessed by the application of big data methods. One typical example is to teach students analyse online ads effects measured by click ratio and purchase rate after crawling the primary data. Their understanding on how to apply big data in hotel marketing issues will be deeper through such cases.

Revenue management is the second category that mentioned by experts to be applicable with big data. Average daily room (ADR), occupancy rate (OCC), and revenue per available room (RevPAR) are representative revenue indexes for measuring hotel operation and sales performance. Considering commissions paying to OTA have increased by 30% of total sales, many experts emphasized the importance

of commission management by providing another big data case for comparing the return rate between hotel independent marketing and OTA marketing.

As the third category of the applicable scope of course, OPERA PMS assists with getting an access to update big data and helps students understand the division operation in hospitality. Almost every expert has referred OPERA PMS as a necessary operational software to make students identify data flows fundamental to big data collection. Through OPERA PMS, students can grasp the implications of big data flows among functional divisions in hotel operation.

Some experts working as hotel managers or Human resource trainer, suggested inner recruitment and staffing should be of higher efficiency if these workloads are processed with big data technology. For example, labour outsourcing and staffing allocation through online sharing platform have been regarded by a few HMs and BDEs as an emerging opportunity for controlling labour cost and related overheads. This kind of platform has been generating the big data flows on human resource and running by the algorithm of big data. As a result, that's why human resource is termed as the fourth category of the applicable scope of course.

Although Hotel Engineering and Inventory Management is listed as selective course in most hospitality schools in the mainland of China and Taiwan, several experts acclaimed the power & utilities control should be part of hotel engineering management since most hotels tend to be environmentally friendly as well as cost-efficient. If big data technology is applied to track the customer usage habit on linens, utilities etc., then proper low-carbon option will be designed in the areas of inventory cost control, purchasing management and energy control, which contributes more big data-oriented cases in Hotel Engineering and Inventory Management course. Some experts' views are described in the following excerpt:

If PMS can update the data sourced from OTA, many cases can be studied in online marketing area. For instance, we can analyse the online WOM of our hotel by text-mining reviews (R5).

All sorts of flows generated from hotel operational activities can be read as data. Big data technology is a tool to detect and collect these flowing data. So, any issues occurred in functional divisions like marketing, revenue management and engineering will be solved through big data analysis (R10).

Given existing facilities and teaching faculty for establishing hospitality big data course, the majority of experts suggested this course should open independently for sophomores with 32–48 hours and 3 credits. All the Taiwanese experts and three Chinese experts preferred hiring big data teachers or trainers from Hotel IT department to conduct pilot workshops for students and hospitality lecturers before initiating big data course. These workshops will make students understand the areas of big data application, read and analyse the data flows from revenue management, marketing, OPERA PMS and engineering in the hospitality. However, if there is no qualified big data teacher while the hotel IT trainers have no sufficient time spent on complete course teaching, cooperated teaching by school teachers and IT trainers will be an alternative for curriculum integrated with big data.

Since IT trainers from hotels supplement existed courses with the content of big data, the hospitality teacher will gradually learn to apply big data technology on their main courses, which enable the curriculum reform toward the big data-orientation. No matter what method the hospitality teachers will take for building big data course, understanding implication of the big data in hotel operation cases will be a top priority in related course objectives. As many experts have mentioned in their remarks:

IT Trainers from hotels are better invited to introduce big data knowledge for hospitality students and teachers through a series of workshops...I teamwork with some teachers to resign the courses by adding big data teaching content (R3).

## Discussion and Conclusion

This study provides big data-orientated directions and detailed measures for hospitality curriculum reform through deep interviews on 12 experts from the mainland of China and Taiwan. In prior research, many experts have reached a consensus that the following skills are required for data analysts: analytical skills, IT and programming skills, business and domain knowledge, and interpersonal skills (Jacobi et al., 2014). But for most hospitality students, to cultivate them the big data analytical competence is more vital than data processing competence. When the graduates get into the hospitality career, they are only required to read and analyse the data implications for dealing with hotel operation, then know to solve current problems while data crawling and processing tasks are sourced to data analysts. Under the hospitality education system of mainland of China and Taiwan, one of education objectives is to motivate students to enter the hospitality world as their career choice. This career-oriented objective entails the students to achieve big data analytical competence in hospitality positioned with five sub-competences: operational competence, strategic competence, processing competence with basic data, creative competence and framing competence.

The results of this study also indicate qualifying teaching faculty, constructing teaching facilities and updating the big data base as three dimensions for resource input for big data course in hospitality curriculum. Previous research has proved four types of faculty training in the competency-based curriculum development are an expert, webinar, phone conferences, and self-study (Echols et al., 2018). However, the experts suggested co-teaching with IT managers is the best option while introducing big data teacher will be an effective alternative in a short term. The last way for qualifying the teachers is to rely on inner training because hospitality teachers dominantly lack data science education background.

In light of constructing teaching facilities, a lot of experts recommended to purchase the education version of hospitality software widely used in hotel operations (e.g. Ideas, Opera PMS, Micros etc.). These types of software have recently been updated to be cloud-based, thus result in obtaining big data available without limitation of time and space. Besides of setting up reservation Apps, some experts regarded

that purchase simulation software or ERP can replace hospitality software and updated data will be provided by these software suppliers for free. As for how to acquire big data, the feasible data sources are real data set purchased, open data from NGO or local government and local data from regional hotels. The experts have proposed the practical requirements for data quality are real-time, real and local, which encourage teachers to verify for teaching purpose.

When discussing the scope of course integrated with big data, most of experts emphasized any area where data flows of capital, labour and energy etc. Are generated will be considered to be the content of hospitality big data course. The results show the scope of hospitality courses applied with big data includes marketing, revenue management, OPERA PMS operation, human resource management, engineering & inventory management. The combination of these courses and big data technology indeed reflects the stakeholders' perspectives on the value of data flows sourced from OTA marketing, WOM management, revenue management and green engineering.

It is widely accepted that establishing big data course independently or workshops as introductory training will be very effective for curriculum reform. Moreover, several universities like Beijing Union University and Les Roches Jinjiang Hotel school at Shanghai (LRJJ) adopt the simulation software or ERP to assist with revenue management teaching, which show us how to supplement existed course with big data technology. So far, a growing number of schools have made endeavors to conduct a demonstration course and these demonstration courses have diversified stakeholders' plan to open big data course in both schools and hotels. To sum up, the scope of courses will expand as these demonstration practices show their teaching effects.

Despite the application of big data technology into hospitality curriculum reform is later than academic research on big data topics in hospitality, the areas and issues of related academic study in turn reveal the trend of big data application in hospitality. From these interviews, big data course has been merely designed for Master Program. In support of establishing the similar course for Bachelor Program, we have proposed a number of factors and restrictions for educators to focus on:

### ***To What Extent Big data Technology Is Applied in Regional hospitality Industry?***

If cooperated hotels are located in an area that is less developed in big data technology, real data and teaching assistance to schools are definitely unable to realized, thus this laggard industry status quo will be a barrier for big data course building.

### ***To What Extent the Teaching Faculty from Schools and Hotels Can Cooperate with Each Other for Course Building and Curriculum Reform?***

Teachers can seize this cooperation opportunity to research consensus on teaching objective, chapters arrangement, allocation periods and credits. Besides the hospitality teachers can follow up with the demonstration courses of big data, which can update and reform the main courses in hospitality curriculum in a short time. Nevertheless, the cooperation level is also impacted by relationship between schools and industries, qualities of resource input and hospitality education policy.

### ***To What Extent the Software Can Simulate the Hotel Operation?***

As experts have mentioned there are two types of software to simulate the operation from which big data can be acquired and analysed. First, the education version of hospitality software like OPERA PMS. Second, simulation software like ERP or Hiyield. As for the source of big data source, it's more feasible to evaluate which types of software are optimal to purchase since the data source matched with software will be a kind of upcoming cost. A real, real-time and local data are prospected for better simulation to analyse big data.

### ***To What Extent the Curriculum Reform Value Is Anchored Toward Practicality?***

There is evidence that some schools have already purchased the software or established a big data lab in order to pass the university evaluation from Ministry of Education. Yet without adequate teaching assistance for course building, the big data-oriented reform will receive few effects. Consequently, it calls for the scientific attitude to adopt cost analysis to evaluate whether big data course is worth being built for hospitality curriculum reform. What's more, the deans need to consider if this course development is ready to make curriculum reform practical rather than generate face effects.

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