



IMPLEMENTATION ISSUES AFFECTING THE BUSINESS INTELLIGENCE ADOPTION IN PUBLIC UNIVERSITY

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ABSTRACT

Today, the education sector has become fiercely competitive in recruiting students from across the country and around the world. Anecdotal evidence suggests that universities are good candidates for Business intelligence (BI). BI is the process of gathering correct information in the correct format at the correct time; and delivering the results for decision-making purposes. It also has a positive impact on business operations, tactics, and strategies in the enterprises. There have been numerous reports of BI benefits in private and public sector. Yet, issues influencing BI implementation in a public university could be so numerous that they may affect the effectiveness of a BI implementation. Thus, this paper discusses issues faced by public university in implementing Business Intelligence System. Interviews were conducted with the head of the university divisions and faculties' representatives to elicit their opinion regarding issues faced in managing university data. Data were collected and analyzed using NVivo 10. There are eight main issues identified from the interviewees and these will be used as the foundation in developing a BI system in the university, suggesting important implications for practice and further research.

Keywords: business intelligence, decision support, data management, university management.

INTRODUCTION

BI was first defined in 1958 by Hans Peter Luhn which clarified that BI is divided by two components which are Business and Intelligent System (Ranjan, 2009; Tutunea & Rus, 2012). In the year 1989, Dresner came up with BI concept that stated "as an umbrella term to describe concepts and methods to improve business decision making by using fact-based support" (Negash & Gray, 2008, p. 175). This term was widely adopted by researcher's around the world especially experts in Decision Support System (DSS) field, managers and software developers.

There are several technologies that are capable of assisting BI development, for example Online Analytical Processing (OLAP), Data Mining, Data Warehouse, Executive Information Systems, and DSS (Burstein, Holsapple, Negash, & Gray, 2008). Negash and Gray (2008, pp. 175-193) came up with their concept of BI that states "BI is a strategic information system capable of providing actionable information through a centralized data repository, sourced from numerous sources, transformed into meaningful information via BI analytical tools, to facilitate business insights leading to informed decisions". Furthermore the goal of BI is to assist the decision maker by providing timely and quality information by analyzing a huge amount of data regarding the organization and its routine (Kulkarni, Power, & Sharda, 2007, p. 34).

According to Cheung and Li (2012), BI utilizes a wide category of technologies and applications in order to gather, store, analyze, and provide easy access to data to assist top management to make any important decision.

Nowadays BI is well known to be a top choice for many organizations and its capabilities are rapidly attracting the interest of others to adopt the technology.

(Evelson, McNabb, Karel, & Barnett, 2007). Despite the advantages of BI capabilities reported, there are organizations still struggling to overcome the problems related with the continuously increasing volume, velocity and variety of data that came from many sources. Based on this scenario, adoption of BI always is the top priority in organizations (Luftman & Ben-Zvi, 2010). BI is not only well-known among the industries, but it also attracts and is the topic of interest in academic research (Ramakrishnan, Jones, & Sidorova, 2012).

Despite advantages of a BI system, issues influencing BI implementation in a public university could be so numerous that they may affect effectiveness of a BI implementation. Thus, this paper reports implementation issues observed from a series of interviews of BI adoption in a public university.

CATEGORIES OF BUSINESS INTELLIGENCE SYSTEMS

BI systems can be divided into two categories, namely Reporting Systems and Data Mining Applications (Stylianou, Savva, & Spyrou, 2013). Based on Stylianou *et al.* (2013), a Reporting System is able to filter and sort data while performing calculations. This system usually uses Structured Query Language (SQL) to report any analysis. It is also able to collect and summarize the activities of the organizations and compare current and past activities when needed. Other than that, the system is also capable to predict future activities of the organizations. The timely delivery of reports to the appropriate users and the presentation of data in the appropriate format(s) are also the capabilities of this type of this system (Stylianou *et al.*, 2013).

Data Mining Applications is another category of BI that uses mathematical and statistical techniques to



perform what-if analysis, make future predictions, and also assist in decision making (Stylianou *et al.*, 2013). This application is usually handled by staff that has a good computer skills. This application is design to analyze big amounts of data and identify a specific patterns or relationships including unusual patterns (Stylianou *et al.*, 2013).

BENEFITS OF BUSINESS INTELLIGENCE

Cost benefit analysis of a BI system still remains top priority of discussion among organizations and researchers. It is difficult to define the benefits of BI in the organizations as it is intangible to observe while the cost of BI can easily be determined by usually looking at its feature (Lönqvist & Pirttimäki, 2006; Singh & Samalia, 2014; Williams & Williams, 2010). Previously, IT investments in organizations were usually spent in improving the operational efficiency compared to improving data management (Davenport & Short, 2003; Dewett & Jones, 2001; Forslund, 2007; Williams & Williams, 2010). Adopting BIS, required a huge amount of investment. Compared to their capability in managing data and assisting in decision making process, BI can provide organizations with many benefits and makes it a worthy investment (Singh & Samalia, 2014). Table-1 lists major benefits observed by a firm after deploying BIS.

Table-1. Benefits from implementation of Business Intelligence. Adopted from (Singh & Samalia, 2014).

Major Categories of Benefit	Author(s)
Faster and more accurate business reporting	Berndt Göran Svensson, Pellissier, and Kruger (2011); Đekić & Mladenović-Ranisavljević (2010).
Improved decision-making process	Hocevar and Jaklic (2010); Đekić & Mladenović-Ranisavljević (2010); Carver and Ritacco (2006)
Improved customer satisfaction	Hocevar and Jaklic (2010); Carver and Ritacco (2006); Moss and Atre (2003)
Reduction in costs	Carver and Ritacco (2006); Moss and Atre (2003)
Increase in revenue	(Carver & Ritacco, 2006); (Moss & Atre, 2003)
Improved Quality of Information and Communication	(Popović, Turk, & Jaklič, 2010) (Yeoh, Gao, & Koronios, 2008); (Carver & Ritacco, 2006)
Increase in market share	(Moss & Atre, 2003)

From Table-1, it can be concluded that the implementation of BI provides benefits to organization in term of management, decision making, costs, service quality and marketing.

ISSUES IN BI IMPLEMENTATION

BI has been implemented in many areas of studies (Fitriana, Eriyatno, & Djatna, 2011; Idris, Zulkifli, & Yusof, 2014; Muhammad, Ibrahim, Bhatti, & Waqas, 2014). The proven strengths and capabilities of BI allow it to be adopted in various areas such as Small Medium Enterprise (SME), and health sector. BI and Enterprise Resource Planning (ERP) in SMEs, can assist in achieving operational and organizational goal for example improved productivity, lower costs, reliable performance, reductions in paperwork, saving time and many more (Dekoulou & Trivellas, 2014; Trivellas & Santouridis, 2013). The successful implementation of ERP and BI are also capable to maintain agreements with clients due to their satisfaction in receiving the services or product (Nofal & Yusof, 2013), and allow effective communication with customers while doing business with them (Marinagi, Trivellas, & Sakas, 2014). Learning and fully utilizing BI capabilities can be difficult for managers depending on their company condition and financial stability. It also requires a good understanding of computers and technologies that might be difficult to some managers (Hwang, 2009).

BI is also known to be implemented in Electronic Health Record (EHR). Integrating BI technology with EHR can provide good benefits in term of “increased autonomy and flexibility of users, when it comes to creating reports, quick and simple analyses, improved decision support and operational efficiency, as well as a range of new analytical functions” (Hočevár & Jaklič, 2008, p. 116). Hočevár and Jaklič (2008) also mentioned other benefits include “ease of use, time-saving, improved decision support, flexibility, and positive reactions of customers due to faster responses”. The benefits received by adopting BI in EHR make other healthcare providers and healthcare IT professional to adopt BI as well (Bonney, 2013).

Other than SME and EHR, banking management also implements BI. Implementation of BI technology in banking sector are also capable to assist advance risk management and strategic decision making by analyzing important data that were received from another banking IT systems (Ćurko, Bach, & Radonić, 2007). They also mentioned that by adopting BI in the banking sector, positive outcomes include improves customer relations, raised efficiency of marketing activities, enhanced risk management, faster response to market changes, and, ultimately, raised quality and efficacy of their processes. Implementation of BI in various areas raises several issues. According to Ranjan (2009) who conducted a study about BI, issues such as experts view can cause difficulties in BI implementation. Experts have several own views regarding BI. For example data warehousing experts see BI as a support or supplementary system. Another expert such as data mining experts see BI as an advance support system included with data mining techniques and applications of algorithm. Different to statisticians, they see BI as forecasting and multidimensional analysis based tool. These different views of BI provide difficulty to



organizations to invest in BI. These different views also resulted in different level of priority for them in adopting BI in their organization.

Another issue raised by Ranjan (2009) in implementing BI is managing data warehousing. Integrating data from many systems or any another resources into an enterprise data warehouse is important and challenging in BI due to the large scope of effort required.

Ranjan (2009) also mentioned that even though BI is implemented in many firms and the famous choice in managing information, it is realized that other tools such as ERP and Customer Relationship Management (CRM) are struggling to catch up. Because of the priority that the firms are looking for nowadays is 'right access to information quickly', BI should be implemented carefully and smartly in order to support the business goal and to maintain the operation in the firm.

All the examples of BI implementation in various industry sectors such as health, banking and SMEs shows that it provides good support in decision making. Even though implementation of BI in these industries can be considered successful, several issues are raised with its adoption and usage.

BI IMPLEMENTATION AND ISSUES IN UNIVERSITY

University is a good candidate in implementing BI. As the institution contains many students and staffs, they begin find difficulties in managing the huge data deployed from their different information systems. Ideally, systems that are available in university include the academic system, financial system, Human Resource (HR) system, and Quality Assurance Automated System (QAAS) system. These systems are core of the university daily operations (Alzoabi, Diko, & Alnoukari, 2008).

According to Alnoukari (2009, pp. 11-16), in order for one institution to strive economically, "information patterns and trends should be interpreted correctly and in a timely fashion to align with current trends in order to facilitate sound strategic decision making." (Alnoukari, 2009). Based on the argument, it is important for the top management to have continuous access to information especially the information that related to decision making and strategic planning. By applying BI, the huge numbers of data available were added with values that can benefits the managers to make better decision.

Based on Alnoukari (2009), the implementation of BI in the university will benefit the institution such as data analytics can be used effectively to build future business strategy. Using data analytics and data mining could also reveal hidden reasons for some deficiencies as well as possible high-yielding new investments. In addition, implementation of BI could support the strategic decision making process of the corporation and also SWOT analysis.

BI implementation in university is mainly focused on managing data to support important decision

making for the top management. However, universities face constant challenges to implement BI. For example based on Idris *et al.* (2014) research, two issues has been identified including the amount of data in the university. Academic data is an example of data usually exists in university database. In general this type of data always changes from time to time. The growth of data is also difficult to be measured and predicted. In addition, when the growth of data is increasing continuously, the filtering processes of the important data also become challenging and critical.

Another issue stated by Idris *et al.* (2014) is the cost needed in implementing BI in the university. BI tools and database management systems requires a lot of financial resources to be invested. This could provide difficulties or barrier to the learning institutions especially public universities in deploying BI as a solution for the above issues.

Only few researchers reported issues in implementing BI which are (Ranjan, 2009) and (Thamir & Poulis, 2015). Thus, study on issues in BI implementation for the higher education sector is still limited and scarce. Recent study by Thamir and Poulis discussed about not all organizations succeed in implementing the BI solutions. They reported several challenges from their analysis of previous studies in BI and determine the cause of the failure of implementing of BI solution, "whether the reasons for failed implementation have been predominantly from BI capabilities or implementation strategy which is based on business-driven or technical" (Thamir & Poulis, 2015, p. 1). Therefore, to the best of our knowledge, this is the first study that discussed BI implementation issues in the context of public university in Malaysia.

RESEARCH METHODOLOGY

In-depth interviews were used as the primary research approach (following Mattheu B Miles & Huberman, 1984). Interviews are the most common source of information in IS research, and can be designed to be open ended, semi-structured or survey type. An open, series of semi-structured interviews were conducted to explore the research question, and gain a broad range of perspectives on the benefits of Business Intelligence in organizations. The open nature of the questions also permitted further elaboration. The strength of this approach is to allow participants to frame their answers by sharing what is significant to them. This kind of semi structured interview is known to enable interviewees to think about the topics themes and core content in a new way and to reflect upon their experiences and perceptions (Kramp, 2004; Mattheu B Miles & Huberman, 1984).

According to Boyce and Neale (2006), in-depth interviews should be implemented in a focus group especially when the interviewees may not be comfortable talking openly. When the interviews were conducted in a focus group, information from interviewees can be collected much more detailed as the interviewees can speak freely and openly. By conducting interviews in a



focus group it may also provide a comfortable atmosphere for the interviewees in having conversations. In this study, a focus group is a group interview of approximately five to fifteen people who share similar characteristics or common interests (including the facilitator and his/her assistants). A facilitator guides the group based on a predetermined set of topics. In order to get in-depth information, perceptions, experiences, and issues, the facilitator creates an environment that encourages participants to share their points of view. The primary goal of the field work was to inductively identify issues of Business Intelligence identified from the targeted practice domain (in this case university in Malaysia) and later substantiate them with observations from the literature.

The study focused on Business Intelligence within the university. The study team had good access to a public university in Malaysia – University A. Participants from the university A were included in the study. Investigation into the anticipated issues of business intelligence required insights from those who are directly involved with the area of study (in this case; university management office and university top management). Hence, institutional and department heads who are responsible for providing and managing IT, BI data provider and top management (few of them also act as data owner) were sought as candidate case study participants. Interviews were planned with the major decision maker and executors of these decisions – those who influenced by existing implementation of BI initiative. Table-2 presents the overview of overall participants with the interviewees' background.

Table-2. Focus group of the interviewees.

Focus group	Description
Focus group 1	This focus group involved an interview session with office members of Vice Chancellor of Academic (VCA). This group consists of 5 peoples.
Focus group 2	This focus group involved an interview session with a group of staff from Centre of Information and Communication Technology (CICT). This group consists of 3 peoples.
Focus group 3	This focus group involved an interview session with group of School of Postgraduate Study (SPS). This group consists of 6 peoples.
Focus group 4	This focus group involved an interview session with the AMD. This group consists of 3 peoples.
Focus group 5	This focus group involved an interview session with a group of staff who manage Student Recruitment and Admission Division (SRAD). This group consists of 2 peoples.

Ten (10) interviews were conducted (each 60 – 90 minutes in length) over a 6 week period. All interviews followed the same structure and format (as per – specified by the case protocol), commencing with an open discussion on understanding and perception of business intelligence. They were all conducted in the Malay language and later transcribed and translated into English. The majority of the data collection occurred due to – their high involvement in IT managing university data, managing entire department and their willingness to participate. Table-3 presents the interview sessions with the focus groups explained in Table-2. Some of the interview sessions involved multiple focus groups. Table-3 summarized the interview sessions with focus groups involved in every session.

Table-3. Interviews session and focus group involved.

Interview Sessions	Focus Group Involved
Session 1 (14 th January 2015)	Focus Group 3
Session 2 (21 st January 2015)	Focus Group 3
Session 3 (5 th February 2015)	Focus Group 3
Session 4 (11 th February 2015)	Focus Group 1
Session 5 (16 th February 2015)	Focus Group 2
Session 6 (26 th February 2015)	Focus Group 1, 3 & 5
Session 7 (7 th April 2015)	Focus Group 1 & 2
Session 8 (6 th August 2015)	All focus groups included

All relevant data (interview transcripts, research memos, documents related with BI, etc.) were managed in an NVivo database (following Yin, 2009); (Matthew B Miles & Huberman, 1999). The interviews were analyzed using a content analysis approach (following Flick, 2009). The supplementary documentations were used to collect 'rich' evidence about the business intelligence initiatives and were used to augment and corroborate interview data, which was the main input to at analysis. A deductive approach was used when analyzing the issues towards Business Intelligence adoption (note that the interviews were however collected in an open ended, inductive manner).

STUDY FINDINGS AND DISCUSSIONS

This section presents the findings from case study analysis, reporting on the observed issues towards Business Intelligence adoption. In overall, eight main issues were identified from the case study data which are Enforcement, Data Availability, Communication Engagement, Scattered Data, Missing Data, Information Uniformity, Uncategorized Data and Outdated Data as graphically summarized in Figure-1.



At the moment, there is no enforcement to the staff that require them to use or refer into a specific system. This current situation results in all the staff referring to different sources and this resulted data clash during their presentation in the university meeting. There should be enforcement to all the staff to refer to system where all the information is located. All the data from different sources such as postgraduate office, faculties, treasury office should be centralized in one system where the authorized staff can refer.

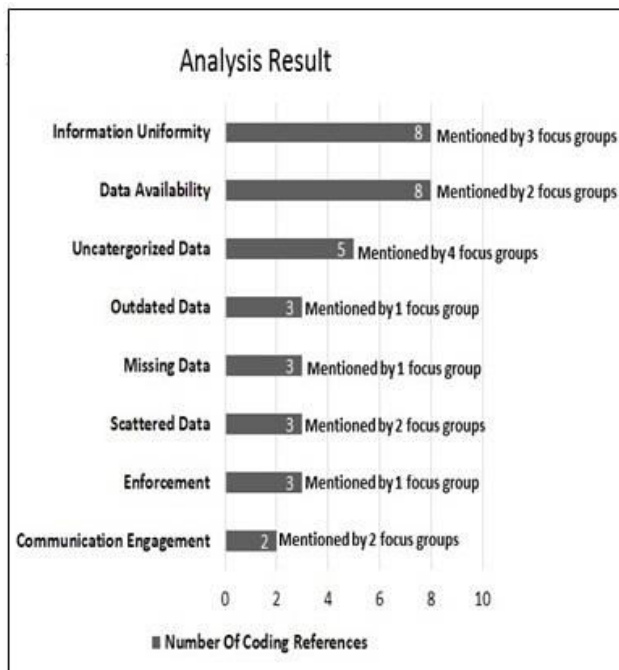


Figure-1. Interviews findings.

One of the interviewees summarizes the issues of enforcement stating, “There is no policy that enforce staff to use systems. There are a lot of systems in the university but there are no policy that require the staff to use it. As a result the managers interpreted the data based on their own opinion” (Interview Session 4, Focus Group 1) Seah, Hsieh, and Weng (2010) also stated that the enforcement and motivational strategies is one of necessary action to face the obstacle in implementing effective BI implementation.

Data Availability

Data availability is an important managerial aspects of the BI implementation (Zhygalova, 2012). In this context, data availability is referring to the availability of data required by the top management to make any important decision. The current situation is the head of departments need to contact their colleagues to ask any information they required anytime and anywhere even though it is after working hours.

For some divisions or departments, they face difficulties to plan their action for example in Human Resource Management, there is lack of planning in terms

of new staff recruitment because they do not acquire information on the total number of staff deficiency in faculties and numbers of staff who retired in the current year. One of the interviewees summarizes the issues of data availability stating; “for Human Resource Management the problem appears when there is no detailed plan for staff recruitment (contract or permanent). There is no system that shows the data such as number of staff in each faculty (total staff insufficiency and number those who will retire in faculties)” (Interview Session 4, Focus Group 1).

Communication Engagement

This issue refers to the lack of communication occurred between data owner and data provider. For example, the data recorded from faculties are different from the university management division. Some of the important data are not valid and also not recorded for visualization purpose. Communication engagement is very important especially when using multiple information systems as data resources as according to Isik, Jones, and Sidorova (2011) “...the quality of communication between these systems directly affects the overall performance” One of the interviewees summarizes the issues of communication engagement stating, “One of the problem regarding data in this university is communication engagement. There are problem regarding communication among responsible party” and another interviewee stating, “There are lack of cooperation between data owner and data provider” (Interview Session 7, Focus Group 1 and 2) Scattered Data

In this context, scattered data refers to the data disseminated everywhere and it cause difficulties to other division to acquire. In this university, there are many sources of data especially in divisions and departments. It is difficult to achieved required data as the data were keep in separate location. It needs to inquire from several places to achieve required data. This problem is usually identified in traditional systems where data is scattered and disparate due to organization use different system for different departments (Zhygalova, 2012).

One of the interviewees summarizes the issues of data communication engagement stating, “when the new university indicator program is created (PTJ), PTJ has no idea to visualize required KAI data to be presented to the top management. Sometimes the data is not located at the right place” (Interview Session 5, Focus Group 2).

Missing Data

This issue refers to the data drop out in student academic management system for example viva date, payment pending, and student admission date. Problems also appear when data were presented to the senate where there were missing data. This causes difficulties to verify student status especially during registration in the new semester.

One of the interviewees summarizes the issues of data dropout stating, “there are data dropout that occurred when downloading information through Academic



Information Management Systems such as viva date, debt, student admission date.” (Interview Session 1, Focus Group 3)

Information Uniformity

There are many systems for student management in order to assist the tasks such as student enrollment, student application, student intake, and student offer. All the data from these tasks were collected in one centralized system in the university. Problem arose when the data received by the current centralized system were not the same with data provider. Some of the received data also do not following a required format causing difficulties to the recipient to analyze the data. This causes the recipient who asked for the data to modify them in order to fit with their requirement.

One of the interviewees summarizes the issues of data uniformity stating, “there are no standard format for data delivery to the responsible party, for example which graph to use for presenting the required type of data.” There are also interviewees stating, “some data downloaded from Academic Information System Management were not following the required format and the validity is also in doubt. For example there are date that shows the student is born in the current year. There are also data for student’s phone number that only shows in three digits in the database” (Interview Session 3, Focus Group 3)

Uncategorized Data

The sources of data were not only received from the departments or faculties, but also coming from Higher Education Ministry in every semester. However, their specific functions were unknown. Sometime the data are not being used at all. This situation also referred to data in the university database. The need to understand the data function is important in making any crucial and immediate decision.

One of the interviewees summarizes the issues of uncategorized data stating, “Ministry of Higher Education portal MyMohes provides data in every semester but the data were too numerous and their purposes data were unknown. There are also times when the data has not been used at all”. Another interviewee also mentioned that “most of the data were available in the university but their function need to be understood. For example, how the data can be used to assist decision making and how the data will be visualized?” (Interview Session 4, Focus Group 1). There is also an interviewee who stated, “sometimes the data provided by Center of Information and Communication Center did not follow the requirements thus causes difficulties to collect and update the data” (Interview Session 1, Focus Group 3).

Outdated Data

This situation usually occurs in university database in student information such as when student changing their course, the information is not updated in the systems. Difficulties arose especially when the

academic division verify information of the student who is about to graduate. The outdated data also provide difficulties when analyzing current university performance where all the updated data is needed to calculate university current performance.

One of the interviewees summarizes the issues of outdated data stating, “sometimes data provided by Center of Information and Communication Center were not updated and has not been used anymore for example postgraduate report for 2014.” (Interview Session 3, Focus Group 3).

According to Kumari (2013), outdated data can give impact on BI quality in term of accuracy. Outdated data can impact analytical and operational of BI (Kumari, 2013). Outdated data should be filtered and removed as they were capable to give impact on the decision making process (Heijnen, 2012).

CONCLUSIONS

In conclusions, this paper discussed the issues regarding BI implementation in the university. Based on the previous study from Alnoukari (2009) and Idris *et al.* (2014), BI implementation in university mainly concentrated on managing a huge data that come from various sources in the university to support decision making process.

Most issues are derived from the internal environment of the university. Thus the university’s internal capability and willingness are very important to the successful of deployment of BI. These issues present particular forms of implementation issues within an institutional context, and highlight the areas where the university needs to improve. Different business units in the university can better realize and understand the challenges of BI implementation, and adjust themselves to achieve a more efficient outcome.

BI solution is able to assist the university to increase its business agility, improve its customer loyalty and acquisition and decrease the operating costs if it is implemented efficiently and properly. The investment of BI solution has tremendous benefits. However, as reported in previous section there are many issues go into the successful BI project. By paying attention to the 8 issues for BI success, the university has a great chance to complete and deliver the features and benefits agreed upon at the beginning of the project. Hence, this study have contributed to a better understanding of the issues and to what needs to be considered when considering BI solutions specifically in the HE sector.

Through these study outcomes, future practice and academia (particularly those interested in implementing BI) are better informed about the generic challenges, some which can be resolved in advance. Good preparation with focus on these challenges can help the university management to open the way for a success adoption of BI solution within university. Researchers also benefit from the study results in terms of guidance for positioning their current research and targeting future research on the topics identified by practice as areas that



need attention. Such work also creates an empirically based awareness on the common issues in the domain of investigation. Hence, this work could be extended to other universities in Malaysia and also other sectors. Palvia and Palvia (2013) encourage that when such extension work (to compare different domains) is done, that one develops and use a consistent instrument and deploys this (as best as possible) minimising other variables – hence conducting the data collection within the same time frame- applying the same method(s).

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