

Conference Paper

Business Intelligence Framework for Mapping Analysis of Crafts Creative Industry Products Exports in West Java, Indonesia

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This paper aims to develop a framework model of a business intelligence system for mapping exports of the creative craft industry in West Java. The main problem is the lagging of the craft industry exports due to the lack of responsiveness in capturing export opportunities. In addition, the absence of a business intelligence system in the craft industry to analyze export mapping in the global market is why this study is important. The research methods used in this literature are data collection and consolidation, identification of information needs, and business intelligence framework design. The data studied in this study are primary data related to export sales of handicrafts in West Java in the form of exporter data, export commodity data (HS code), export trade transactions, export destination country data, and the total value and volume of exports. The proposed model is a BI framework for mapping the creative craft industry exports and the stages of the BI implementation process. Based on the results and discussion, the proposed BI framework design can provide a framework for implementing a business intelligence system to analyze the export mapping of handicraft products in West Java, Indonesia.

Keywords: Business Intelligence System (BIS), decision support system, mapping analysis of craft product exports, craft business indicators

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Published 18 July 2023

Publishing services provided by
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Selection and Peer-review under the responsibility of the TSBEC Conference Committee.

1. Introduction

Currently, the creative economy sector has shown to be a new source of economic power. Despite a decline in global commodity and raw material prices, the creative economy sector has contributed positively to the economies of both developed and developing countries [1]. Additionally, several nations and regions have proposed development strategies tailored to their national circumstances and qualities for the cultural and creative sectors. Social employment and the strength of the national economy will be revived through the quick expansion of the cultural and creative industries. Over time, a nation's pillar industry has evolved into the cultural and creative sector [2],

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including Indonesia. However, the creative business expands faster in 41 developed countries than 158 developing nations [3]. Significant expansion of creative industries in industrialized nations is attributable to a larger share of export markets, as measured by the volume of goods sold and the number of overseas markets entered, compared to emerging nations.

As a country developing a creative industry, Indonesia also has problems with export performance and global competition. Indonesian government assessed that the export contribution of the handicraft industry in Indonesia was lagging and unable to compete with other countries [4]. For example, furniture, home decor, and other handicrafts are still left behind in Vietnam [5]. In addition, lagging in capturing export opportunities is why the handicraft industry exports in Indonesia are only at the middle level in Southeast Asia [6]. Exports of the handicraft industry experienced a decline in fluctuations in West Java for the last five years, from 2015-2020 [7]. It must concern the government, business actors, and related parties [8]. The handicraft industry commodity is very promising to drive the economic engine and, at the same time, improve the welfare of business actors because the export market is enormous, especially now that we have entered the era of the industrial revolution 4.0, where internet-based technology is very much needed to increase the export acceleration of the craft industry [9].

Based on the results of interviews with the West Java Disperindag Head of Export, West Java Deskransda, West Java Chamber of Commerce and Industry, and various handicraft export actors, they believed that export constraints and barriers needed to be removed right away, and the craft business actors in West Java should improve their understanding of how to take advantage of export opportunities. Therefore, in order to accelerate the export of products, it is necessary to adopt information technology that can analyze the export mapping of the products of creative handicraft industry in West Java. It is also done to enable business players to see the potential of handicrafts to compete in the global market. One of the information technology approaches that can be used is a business intelligence system [10].

Business Intelligence (BI) is technology, applications, and processes in collecting, storing, accessing, and analyzing data to make better decisions [11]. BI is currently used in various sectors, ranging from educational institutions [12], health institutions [13], banking industry [14] to tourism [15]. BI system was developed to transcribe data into information and knowledge, creating multiple environments for effective decision-making, strategic thinking, and action in organizations [16]. The research study focuses on filling limitations regarding the role of business intelligence framework for mapping analysis of the creative craft industry due to the fact that the minimal part of business

intelligence for the export mapping craft industry has been found in previous literature. Concerning exploring the export potential of handicraft products in West Java, the BI system needs to be developed to study business opportunities and challenges from past data to describe future business potential forecasts. Some data sources that can be analyzed are primary data sourced from data on export sales of handicraft products. It is taken from the West Java Province Disperindag, related government regulations or policies, data from interviews and field surveys with craft business people, and secondary data from other external data. Therefore, the author emphasizes the importance of developing a business intelligence system for export maps based on potential, trends, and characteristics to accelerate exports of creative craft industry products in West Java.

1.1. Literature review

H.P Luhn as an information science pioneer in 1958 was first mentioned the term of business intelligence (BI) [17]. Architecture, databases, analytical tools, techniques, and applications that might help with decision-making are all included under the umbrella term of business intelligence (BI) [15]. There are four main components of BI, namely: data warehouse, business analytics, business performance management (BPM), and user interface [15]. The user interface on the BI system is usually represented in the form of a dashboard or data visualization that allows two-way communication between the user and the system to see a comprehensive view of the company's performance measures [15]. The BI system was developed to transcribe data into information and knowledge to support the company's effective decision-making and strategic actions [16]. The role of the BI system is to support decision-making, starting from the data collection and consolidation process through ETL and data warehouse/database, data analysis and reporting through OLAP, as well as data drilling (data drilling) through data mining.

Currently, BI has been widely used in various sectors, ranging from educational institutions [12], health institutions [13], banking industry [14] to tourism [15]. Several examples of research related to BI in the tourism sector were carried out by Thanatron et al. in 2017 [15] and Evan Hilmawan et al. in 2019 [18]. In order for festival organizers to better understand visitor behavior based on business performance indicators (such as sales, profits, satisfaction scores, costs, loyalty, visitation intentions, and revisit) and thus increase customer satisfaction as well as future revenue and profits for the organizers,

Thanathron et al. conducted a study in 2017 to apply BI to study data on visits to local food festivals in Thailand [15].

This study develops a business intelligence system framework for mapping analysis of handicraft industry product exports in West Java. The proposed model can be set to become a prototype of the BI system that can be useful for both craft business players and the government to see the potential of the handicraft export market in the future.

2. Methodology

This research was carried out in three stages: data collection and consolidation, identification of information needs, and designing a business intelligence (BI) framework. Each step has several activities, as illustrated in Fig. 1 below:

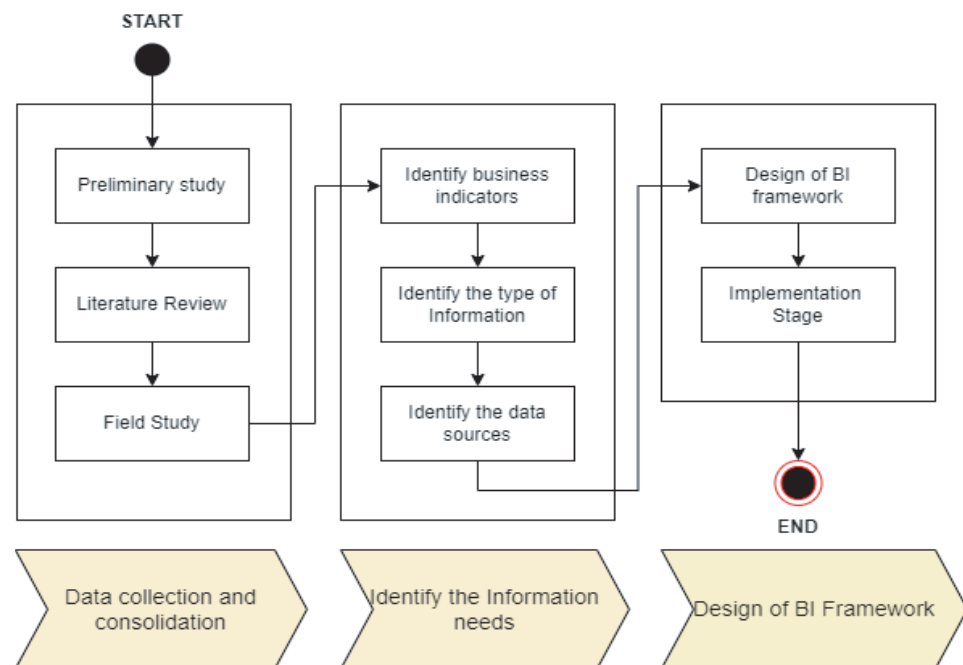


Figure 1: Research methodology.

2.1. Data collection and consolidation

Data collection and consolidation were carried out to explore export trade data for the handicraft industry in West Java, both exporter data, handicraft export commodity data based on the HS code (harmonized system), trade transaction data, export destination country data (importers), and export trade recapitulation reports. Primary data sources were obtained through field studies of the West Java Department of Industry and Trade

(Disperindag), the West Java Tourism and Culture Office (Disparbud), and the Central Statistics Agency (BPS) West Java. Besides that, secondary data was also explored to understand the current conditions of the West Java handicraft export trade obtained from various sources.

Some of the craft export commodities studied in the development of this system are commodities with HS code in chapter 44 for wood and woodworking, 46 for articles of the base, 67 for prepared feathers and penguins and their works; artificial flowers; hair works, 69 for ceramic products, and 96 for miscellaneous works (see Table 1).

TABLE 1: HS Code of handicraft export commodities.

No	Chapter Code	Chapter Description	Heading Code
1	44	HS Code for Wood and woodworking	4401, 4402, 4403, 4404, 4405, 4406, 4407, 4408, 4409, 4410, 4411, 4412, 4413, 4414, 4415, 4416, 4417, 4418, 4419, 4420, 4421
2	46	HS Code for Articles of base	4601, 4602
3	67	HS Code for Prepared feathers and penguins and their works; artificial flowers; hair works	6701, 6702, 6703, 6704
4	69	HS Code for Ceramic products	6901, 6902, 6903, 6904, 6905, 6906, 6907, 6909, 6910, 6911, 6912, 6913, 6914
5	96	HS Code for Miscellaneous works	9601, 9602, 9603, 9604, 9605, 9606, 9607, 9608, 9609, 9610, 9611, 9612, 9613, 9614, 9615, 9616, 9617, 9618, 9619, 9620

2.2. Identification of information needs

Information needs in the BI system need to be designed effectively to provide knowledge to stakeholders. This stage is carried out by reviewing the information required by the BI system for mapping handicraft exports, starting from the handicraft export business indicators, types of information, and data sources.

2.3. BI framework design

As per the BI concept outlined in the study, this stage is utilized to divide the BI framework into three components: (1) data collecting, (2) data access, and (3) data analysis [19]. Internally sourced operational data that belongs to the business makes up a portion of the data used in the BI process. External data is gathered from a variety

of sources, such as the government, agencies, suppliers, consumers, competitors, the internet, and others. ETL will be used to extract, transform, and load the heterogeneous data controlled by BI into the data warehouse. Stakeholders will be able to use the data warehouse’s analyzed results as knowledge to aid in decision-making.

3. Result and Discussion

3.1. Craft export business indicators and types of information

To realize a BI system in an organization, it is necessary to rank information needs that are defined based on the organization’s interests and can highlight essential indexes for achieving business strategy [16]. In setting indicators for handicraft export business, it is necessary to observe the quality index of the components of business determinants, starting from commodity, exporters, market trends, range of exports, infrastructure, and others. In addition, it is also necessary to determine the type of information and data sources so that the data to be managed in the BI system can also be identified.

TABLE 2: Craft export business indicator.

No	Craft Export Business Indicator	Information Type	Data Sources
1	Commodity Quality Index	Craft Export Commodities (Based on HS Code)	Db Commodity
2	Business People Quality Index	Craft Export Company	Db Exporter
3	Quality Index of Handicraft Export Sales	Total Craft Export Sales	Db Commodity, Db Export Trade
4	Market Trend Quality Index	Time Series of Handicraft Export Sales	Db Commodity, Db Export Trade
5	Export Market Acceptance Quality Index	Total Craft Trade in Percentage of GDP	Db Export Trade
6	Export Reach Quality Index	List of Craft Importing Countries and Geographical Distances	Db Importer, Db Country
7	Market Size Quality Index	Total Country Population and Urban Population	Db Country
8	Infrastructure Facility Quality Index	Logistics Supporting Infrastructure Facilities (Length of Highways, Railroads, Ports, Airports)	Db Country
9	Cultural Comparison Quality Index	Hofstede Index Countries	Db Hofstede Index, Db Country

Table 2 determines nine business indicators as determinants of handicraft export sales. The information from these indicators is obtained from various data sources, databases, spreadsheets, and application programming interfaces (APIs) from legacy systems. The ETL process will transform these multiple data into a data warehouse. This process is carried out to ensure the required data is clean and can be used for BI analysis needs [19]. There are six databases as data sources for the handicraft export business indicators that have been identified, namely: Db Commodity, Db Exporter, Db Country, Db Importer, Db Export Trade, and Db Hofstede Index. The data will be obtained through online analytical processing (OLAP) for analysis needs and information that can support decisions.

3.2. BI framework design

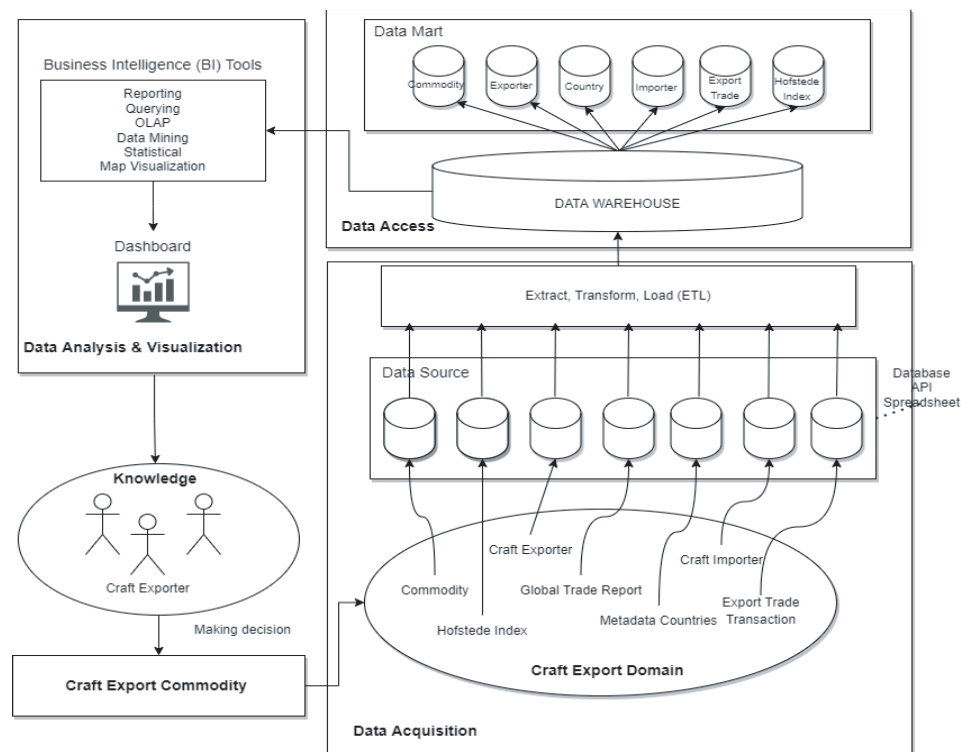


Figure 2: BI framework for mapping craft exports.

Fig. 2 shows the BI framework design developed in this study. The main components of the BI framework consist of three parts: data acquisition, data access, and data analysis and visualization, as the general BI framework that has been understood and become a guideline for practitioners, academicians, and researchers [19]. The developed BI system must be able to generate knowledge for craft export actors by processing dynamic export trade data so that they can see the latest export market

mapping based on the export commodities owned. The following are the steps carried out for each of the main components of the BI framework developed:

1. **Data Acquisition:** Data related to the handicraft export domain, as identified in table 2, will be loaded into a data warehouse through the online transaction processing (OLTP) mechanism and stored in the operational database. The format of the data to be processed allows it to come from various legacy systems and other structured data sources so that the data format will vary, both in database form (such as SQL Server, Oracle, DB2, Informix), spreadsheet form (CSV file, XLS), or API forms (JSON files, XML). Before the data is loaded into the data warehouse, it will first be processed through the following stages: **(1) extraction and cleanse** as a preprocessing stage to filter data from inconsistencies, missing values, or invalid data so that they can be appropriately extracted into an operational database, **(2) transform** as a stage that will integrate various data formats and map them to fit the data warehouse schema, and **(3) load** to load the cleaned data into the data warehouse.
2. **Data Access (Storage):** after the ETL data is stored in a data warehouse, the data can be accessed and analyzed further through a subset of data warehouses or data marts. This stage will produce 6 data marts (DM), namely DM Commodity, DM Exporter, DM Country, DM Importer, DM Trade Export, and DM Hosted Index. Each data mart can be formed into a BI prototype through the access component owned by BI tools, which can accelerate BI visualization development for individual data marts.
3. **Data Analysis and Visualization:** This stage is carried out to analyze and visualize data in reports or dashboards. BI tools have a graphical user interface (GUI) component that can represent data in various visual forms. Standard features possessed by BI tools include reporting, querying, data analytic tools (OLAP/ROLAP), data mining, statistical, machine learning, and visualization tools. Data analysis can be carried out according to the information that needs to be measured at BI; this process will process the data warehouse that has been formed to measure the craft business indicators as identified in table 2. The output of this stage is the formation of a BI dashboard mapping handicraft exports as knowledge for the perpetrator's craft business.

The BI framework developed has a flow that is interconnected with each other, where the dashboard produced by BI can support the decision of craft business actors to export handicraft commodities, and the results of export commodity trade will then become

input for the BI system to be reprocessed into the latest information. It allows the BI system to always learn to produce better craft export mapping information.

3.3. BI implementation stages

To implement the BI framework that has been developed, the first step that needs to be done is to build a data warehouse. One of the schemes that can be used is the star schema which divides the data table into dimension and fact tables. The fact table contains metrics from a business process, while the dimension table contains data context [20]. With reference to the datasource in table 2, the dimension tables in this study are Commodity, Exporter, Importer, Country, and Hofstede Index, while the fact table is ExportTrade. In order to improve the data analytic aspect in decision making, the visual design of the BI dashboard needs to be developed effectively because the inappropriate use of visuals can mislead users and shift focus on the wrong things. Several stages that need to be done in designing a BI dashboard are as follows [21]: (1) data sources in the BI system must be prepared as a data mart (DM) or data warehouse (DW) before being converted into a dataset; (2) a subset of the dataset must be prepared for visualization; (3) the threshold for the visualization data must be chosen; (4) the appropriate visualization must be chosen based on the requirements of the dataset; and (5) the visualization must be placed on the dashboard and connected to the dataset.

Some BI tools that can be used to develop enterprise dashboards are Spago BI, Power BI, Tableau, QlikSense, and Jaspersoft. The results of comparisons that have been carried out [22] show that Power BI has advantages in terms of ease of use, support for various data sources, data security factors, and integration in the cloud. It can be considered in implementing BI in further research.

4. Conclusion

This study seeks to find a solution to increase the acceleration of the creative craft industry exports by creating a framework model for the business intelligence system mapping the handicraft industry in West Java, Indonesia. The model developed in this paper is based on a literature review and data collection from several important institutions to formulate an appropriate business intelligence system framework. Through the BI solution, the owner or manager of the creative craft industry in West Java is expected to have important information to help make export decisions that have the potential to increase sales. In addition, this paper can give a foundation for constructing a business

intelligence system to assess handcraft export mapping in the province of West Java, Indonesia.

Acknowledgments

The authors would like to thank the Ministry of Education, Culture, Research and Technology, Directorate of Research, Technology and Community Service, and Directorate General of Higher Education, Research, and Technology for funding this research through the Research Contract Project Number: 156/E5/PG. 02.00.PT/2022, May 10, 2022.

References

- [1] Asmoro T, Rodoni R, Meirinaldi M. Factors affecting export performance Indonesian fashion creative industry. 2022;
- [2] Wang J. Research on the influencing factors of Chinese culture creative products export. Proc 7th Int Conf Econ Manag Law Educ (EMLE 2021). 2022;649.
- [3] De Beukelaer C. Creative industries in “developing” countries: Questioning country classifications in the UNCTAD creative economy reports. *Cult Trends*. 2014;23(4):232–51.
- [4] Kompas.com. Jokowi: Indonesia Tertinggal dari Negara Lain dalam Menangkap Peluang Ekspor. 2020.
- [5] Merdeka.com. Jokowi: RI Masih Sangat Tertinggal dalam Menangkap Peluang Ekspor. 2020.
- [6] Kontan.co.id. Sinergitas Antar Instansi Dorong Pemulihan Pasar Ekspor Produk Kreatif. 2020.
- [7] Disperindag. Data Ekspor Kerajinan Provinsi Jawa Barat. Bandung; 2020.
- [8] Najafi-Tavani S, Najafi-Tavani Z, Naudé P, Oghazi P, Zeynaloo E. How collaborative innovation networks affect new product performance: Product innovation capability, process innovation capability, and absorptive capacity. *Industrial Marketing Management*. 2018;73:193–205.
- [9] Ginting G. Collaborative network: Bringing co-innovation to competitive creative industries in the ASEAN economic community. *Review of Integrative Business and Economics Research*. 2019;8(1):85–98.
- [10] Tavera Romero CA, Ortiz JH, Khalaf OI, Prado AR. Business intelligence: business evolution after industry 4.0. *Sustain*. 2021;13(18).

- [11] Nyanga C, Pansiri J, Chatibura D. Enhancing competitiveness in the tourism industry through the use of business intelligence: A literature review. *Journal of Tourism Futures*. 2020;6(2):139–151.
- [12] Scholtz B, Calitz A, Haupt R. A business intelligence framework for sustainability information management in higher education. *International Journal of Sustainability in Higher Education*. 2018;19(2):266–290.
- [13] Foshay N, Kuziemy C. Towards an implementation framework for business intelligence in healthcare. *International Journal of Information Management*. 2014;34(1):20–27.
- [14] Prayitno D. Application of business intelligence for banking performance based on products analysis. *International Journal of Progressive Sciences and Technologies*. 2018;6(2):554–569.
- [15] Vajirakachorn T, Chongwatpol J. Application of business intelligence in the tourism industry: A case study of a local food festival in Thailand. *Tourism Management Perspectives*. 2017;23:75–86.
- [16] Olszak CM, Ziemia E. Approach to building and implementing Business Intelligence systems. *Interdisciplinary Journal of Information, Knowledge, and Management*. 2007;2:135–148.
- [17] Vizgaitytė G, Rimvydas S. Business intelligence in the process of decision making: Changes and trends. *Ekonomika*. 2012;91(3):147–157.
- [18] Saragih EH, Bayupati IPA, Putri GAA. Pengembangan Business Intelligence Dashboard untuk Monitoring Aktivitas Pariwisata (Studi Kasus: Dinas Pariwisata Provinsi Bali). *Jurnal Teknologi Informasi dan Ilmu Komputer* 2021;8(6):1159.
- [19] Rafi KA, S.M.K Q. Business intelligence: An integrated approach. *Business Intelligence Journal*. 2012;5(1):64–70.
- [20] Adamson C. *Star schema - The complete reference*. The McGraw-Hill. McGraw-Hill; 2010. p. 513.
- [21] Orlovskiy D, Kopp A. A business intelligence dashboard design approach to improve data analytics and decision making. *Inf Technol Interact* 163. 2020.
- [22] Gowthami K, Kumar MRP. Study on business intelligence tools for enterprise dashboard development. *International Research Journal of Engineering and Technology*. 2017;4(4):2987–2992.