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Business Intelligence Dashboard Human Resource Capacity to Increase the Capacity City of Bekasi

R Wisnu Prio Pamungkas[1], Rakhmi Khalida[2]*

[1,2] *Universitas Bhayangkara Jakarta Raya, Bekasi,* Indonesia

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Correspondence

E-mail: rakhmi.khalida@dsn.ubharajaya.ac.id*

A B S T R A C T

Bekasi City with qualified and evenly distributed human resources will be better able to meet dynamic and complex development needs. Effective data visualization can simplify complex information related to HR capacity, such as education levels, skills distribution, and the number of workers in various sectors, making it easier for policy makers to design strategies including identifying the distribution of filling several positions based on gender and identifying areas of need for educational facilities, children's health, and other infrastructure that supports the growth and development of the younger generation, and developing more effective policies to improve the overall capacity of the city. This research aims to develop a human resource capacity data visualization model as a tool in improving city capacity. This research uses Google Looker Studio as a data visualization platform, data integration is done by Extract, Transform, Load (ETL) method, the data starts from Excel then cleaned, adjusted the format and loaded into Google Sheets. The data used includes key variables that describe the characteristics of human resources in the Bekasi city area, such as education, age group, gender, and demographic distribution. The results show that based on the dashboard visualization, the Bekasi City government can increase 10% representation of the number of women in supervisory and administrator positions in 2 years and the number of only 5% at the S2 or S3 education level requires an increase in education to support the optimization of HR for strategic positions.

1. Introduction

Bekasi City, as one of the growing urban centers in Indonesia, faces various challenges in human resource management and city capacity building. As the population continues to increase, the need for effective planning, efficient resource allocation, and data-driven decision-making becomes increasingly important [1]. One of the key aspects in supporting the city's development is the use of data to understand and improve the capacity of its human capital.

Based on statistical data for 2023, the number of Civil Servants (PNS) in Bekasi City shows a varied distribution based on education level. The majority of civil servants have a Bachelor (S1) educational background with a total of 5,199 people, consisting of 1,805 men and 3,394 women. Other education levels such as Diploma III / Akta III are also quite significant, with a total of 719 people. Meanwhile, only 21 civil servants have doctoral degrees. This distribution reflects the potential as well as the challenges for the Bekasi City government in managing and improving human resource capacity. With the dominance of a Bachelor's

degree-educated workforce, a more targeted capacity development strategy can be focused on maximizing their contribution in various strategic sectors.

The capacity of a city to develop and adapt to change is highly dependent on the strength of its Human Resources (HR). Human capital capacity plays a crucial role in running and developing the systems that support urban life [2]. Competent and well-distributed human resources are key elements that support the performance of the public and private sectors, and ensure the continuity of urban development in various fields, such as infrastructure, economy, education, and health [3]. High-capacity human resources enable cities to adapt to changes and challenges. People trained in creative thinking and problem-solving can develop innovative solutions that increase the city's competitiveness, both in attracting investment and in attracting talent. As a result, cities can compete with other cities in providing a good quality of life, which in turn supports local economic growth [4]. As the need for data-driven urban planning increases, governments and other stakeholders need a deeper understanding of the conditions and human capital capacities available in the region [5]. However, in Bekasi City, data on HR is often scattered across various agencies, poorly integrated, or poorly analyzed, hindering effective decision-making.

In the digital era, the existence of Business Intelligence (BI) technology is a solution to overcome this challenge. BI offers the ability to integrate, analyze, and visualize data comprehensively, thus providing deep insights to policymakers [6]. In their article, Asher and Eka created an interactive dashboard for BASARNAS SAR regional offices in Indonesia by utilizing Google Looker Studio. The main objective of their research was to present SAR operation data visually, displaying areas with the highest number of SAR operations, visualization of data based on time, and visualization of uneven distribution of resources. Strategic decisions made include the placement of additional personnel, equipment, or SAR posts at these locations to improve efficiency and effectiveness [7]. Another paper by Florencondia et al, integrating Google Looker Studio with Google Sheets enables real-time synchronization and web-based monitoring of key performance indicators (KPIs). The dashboard offers detailed insights such as number of tasks, average KPIs, and monthly performance graphs, providing a comprehensive performance evaluation. The implementation of this system has been well received by the team, with survey results showing improvements in performance metric tracking, ease of use, and better collaboration [8].

Based on a brief discussion of previous research, the implementation of a BI dashboard for HR capacity in Bekasi City will result in various strategic benefits. This dashboard not only helps present data visually and interactively, but also enables in-depth analysis with accurate and up-to-date information, policy makers can identify strengths, weaknesses, plan more effective programs to improve HR capacity in various sectors in real-time and more structured, which in turn will have an impact on improving the overall capacity of the city [9].

The implementation of a BI dashboard for human resource (HR) capacity in Bekasi City has various strategic benefits. The dashboard not only helps present data visually and interactively, but also enables in-depth analysis [10]. With accurate and up-to-date information, policy makers can plan more effective programs to improve HR capacity, which in turn will have an impact on improving the overall capacity of the city. Dashboard visualization is an important approach in simplifying and conveying complex information about HR capacity, thereby supporting effective and evidence-based decision-making [11] . Dashboard visualization allows policy makers to see trends and patterns more easily. Governments can present more transparent information to the public, allowing citizens to understand how the city's human capital is being managed [12].

Google Looker Studio, previously known as Google Data Studio, is a Business Intelligence tool that offers intuitive, interactive, and cloud-based data visualization solutions [13]. This tool facilitates the integration of data from various sources and allows users to design visual dashboards that are easy to understand and use by various parties, including policy makers and the general public. The city government's use of Google Looker Studio can be used to create data visualizations that illustrate the

distribution of HR skills, educational qualifications, experience, and training needs in various areas of the city [14]. This provides clear insights into areas that require further HR capacity development, so that HR improvement programs can be directed more precisely.

The use of Google Looker Studio also allows stakeholders to monitor important indicators related to HR capacity in real-time, such as unemployment rates, the availability of experts in strategic fields, and the distribution of skilled labor in areas of need [15]. This allows the government and private sector to identify trends, gaps and opportunities in HR capacity development. The resulting visualizations can serve as the basis for strategic planning, such as the provision of specialized training programs in areas with specific skill shortages or the development of infrastructure that can attract skilled workers to certain areas. [16].

This research aims to explore the use of Google Looker Studio in visualizing HR capacity data to support city capacity building. With a more intuitive and accessible data display, it is expected that policy making at the city level can run more efficiently and be relevant to the needs of the community [17]. Furthermore, by utilizing data visualization through Google Looker Studio, the city government has the opportunity to optimize HR performance, maximize local potential, and create a more inclusive and sustainable urban environment [18].

Research and development of a Business Intelligence Dashboard for HR capacity in Bekasi City is very relevant. In addition to supporting data-based planning, this step is also in line with the vision of Bekasi City as a modern, inclusive, and competitive city at the national and global levels. BI implementation also provides added value in the form of transparency, efficiency, and accountability in HR data management and encourages faster and more targeted decision making.

2. Method

The method used in this research is a quantitative case study, because this research aims to describe the capacity of human resources (HR) in Bekasi City through Google Looker Studio-based data visualization, data interpretation that can show patterns, relationships, and trends in existing HR capacity and in-depth analysis of human resource capacity in Bekasi City based on numerical and measurable data. Dashboard visualization is done using Google Looker Studio because it supports integration with various data sources as done in this research using Google Sheets and then custom dashboard visualization tailored to user needs such as depicting various HR capacity indicators comprehensively, including grouping by age, education, or work experience. [19].

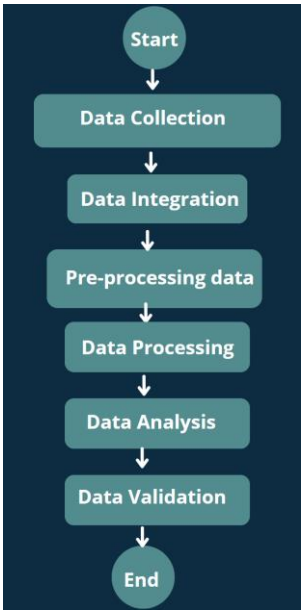

Figure 1. Research Methods

The data collection stage in Figure 1. is that the data required for the research is collected from official website disdukcapil Bekasi City [20] and the population data used is 2023 data. The aim is to obtain comprehensive and relevant information related to the HR capacity of Bekasi City.

Table 1. Population Data of Bekasi City in 2023

No	District	Male	Female	Total
1	Bantargebang	67,806	61,705	129,511
2	Bekasi Barat	156,517	149,703	306,220
3	Bekasi Selatan	117,563	116,672	234,235
4	Bekasi Timur	132,396	128,363	260,759
5	Bekasi utara	204,068	198,362	402,430
6	Jatiasih	133,692	131,859	265,551
7	Jatisampurna	79,589	81,618	161,207
8	Medansatria	97,423	96,074	193,497
9	Mustikajaya	147,746	147,198	294,944
10	Pondokgede	159,838	160,411	320,249
11	Pondokmelati	82,997	83,435	166,432
12	Rawalumbu	137,425	141,391	278,816
		1,517,060	**1,496,791**	**3,013,851**

Once the data has been collected, the next step is to integrate the data into Google Sheets that is ready to be processed. This integration is very important to ensure that all data from various sources are in a uniform and consistent format, and to enable the use of analysis tools such as Google Looker Studio. This integration process includes data normalization, which ensures consistent data formats, equalizing date formats or units of measurement, and other technicalities, which combine data from various sources and create a centralized database, so that information can be accessed and analyzed holistically [21].

Data pre-processing involves cleaning the data from errors or inconsistencies that may arise during collection or integration. This process includes data cleaning i.e. removing duplicate data, correcting incorrect values, or dealing with missing data, another process is data transformation i.e. converting data into a format suitable for analysis, converting textual data into numerical data when required for statistical analysis and the last process is data compilation i.e. organizing data into groups or categories that are easier to interpret according to the purpose of the analysis [22][23].

In the processing stage, the integrated data will be processed so that it is ready for analysis. With the data ready, visualization can be formed in the form of a dashboard that presents graphs, maps, or dynamic tables [24]. After the data model has been determined, the next step is to create a data visualization to be used for further analysis. Google Looker has a feature that can combine several visualization elements into a structured report that can be shared with stakeholders [25]. Data that is ready to be visualized because the data is clean and ready to be used for further analysis on Google looker can save the cleaning work so that it can be used again [26].

Once the data has been processed, the next step is to conduct an analysis to uncover patterns or trends relevant to increasing city capacity. In this research, Google Looker Studio was used for data visualization [27]. The analysis includes identifying patterns and trends that emerge from the Bekasi City population distribution map data, the distribution of filling several positions based on gender and identifying areas of need for educational facilities, children's health, and other infrastructure that supports the growth and development of the younger generation [28]. The results of this analysis are then validated to facilitate decision-making for stakeholders and Insight HR.

Data validation is carried out using the chi-square test to evaluate the accuracy of the data in the dashboard and ensure that decisions made based on the data can be justified and relevant for decision

making [29]. The validation stage includes verification of data with the original source, namely ensuring that the data that has been integrated and processed is still in accordance with the original source [30].

3. Results and Discussion

3.1. Integration Excel to Google Looker Studio

This section explains the steps to use Google Looker (Looker Studio) to process data from an Excel file. To use Google Looker (Looker Studio) with data from an Excel file, the first step is to upload the Excel file to Google Drive. The Excel file to be uploaded must undergo pre-cleaning, ensuring that each column has clear and consistent names without special characters, avoiding empty cells or irrelevant data. The data format should also be checked, such as ensuring that numbers or dates match the correct data type. Once uploaded, the file will then be selected and connected to Looker Studio.

Once the report is open and after the file is connected, the data will be validated to ensure that the columns and rows are imported correctly. If necessary, settings to change the data type or modify the format can be made. The configured data will make it easier to create visualization dashboards. Various types of visualizations such as bar, line, or pie charts, interactive maps can be added. Interactive filters such as dropdowns or sliders can be added to allow data reports to be filtered based on certain parameters, for example by region or date.

Once the report is open, the option to add data should be selected, and from the list of available data sources, the uploaded Excel file should be chosen. Once connected, the data will be validated to ensure the rows and columns are imported correctly. If necessary, settings can be adjusted to change data types or modify formats. Configured data facilitates creating visualization dashboards. Various types of visualizations can be added, such as bar charts, line graphs, or pie charts, by selecting the "Add a Chart" menu. If the data contains geographic elements, interactive maps can be included. These visual elements should be arranged in a neat and informative layout. Interactive filters such as dropdowns or sliders can also be added, allowing the report to filter data based on specific parameters, such as region or date.

After completing the dashboard design, customization should be performed to make the report more visually appealing. Adjusting the layout, colors, and chart fonts can enhance aesthetics and professionalism. If needed, the Calculated Fields feature can be used to create new columns based on formulas or specific calculations. Data visualization can be achieved by selecting suitable chart types, such as bar charts, line graphs, or tables, and adding relevant visual elements.

For further analysis, dimensions and metrics can be added as required. Calculated fields can also be employed for additional calculations based on existing data. Filters can be applied to allow users to view more specific subsets of the data. The interactive and informative dashboard design can then be customized, and the finalized dashboard can be saved and shared with relevant parties using the sharing options provided. Finally, if the data in the Excel file is updated, the data refresh process in Looker Studio can be carried out to ensure the report reflects the latest information.

3.2. Dashboard Visualization

This section contains data visualizations and analyses that present results to high-level policy makers. Some of the visualizations created from the data collected are:

Figure 2. Map of Population Distribution in Bekasi City

The distribution map regarding the number of residents in Bekasi City based on gender and sub-district which can be seen in Figure 2 produces a detailed analysis, namely North Bekasi Sub-district has the highest population. The high population in North Bekasi indicates a large need for infrastructure and public services such as transportation, health, education, and green open space management. The Bekasi City Government needs to consider development policies that focus on sub-districts with high population numbers to maintain the quality of public services and avoid congestion or inequality of access [31]. The sub-district with the lowest population is Jatisampurna. Jatisampurna with its relatively low population, the development of basic facilities is still important to ensure equitable quality of life between sub-districts . In almost all sub-districts, the gender distribution between men and women is relatively balanced. The difference in numbers between men and women is not significant.

The distribution map shows the geographical distribution of the population in Bekasi City with densely populated sub-districts located in the western and central parts, which are close to the Jakarta City border. This distribution shows the potential for high interaction with Jakarta, both in terms of labor mobility and the use of cross-city public facilities.

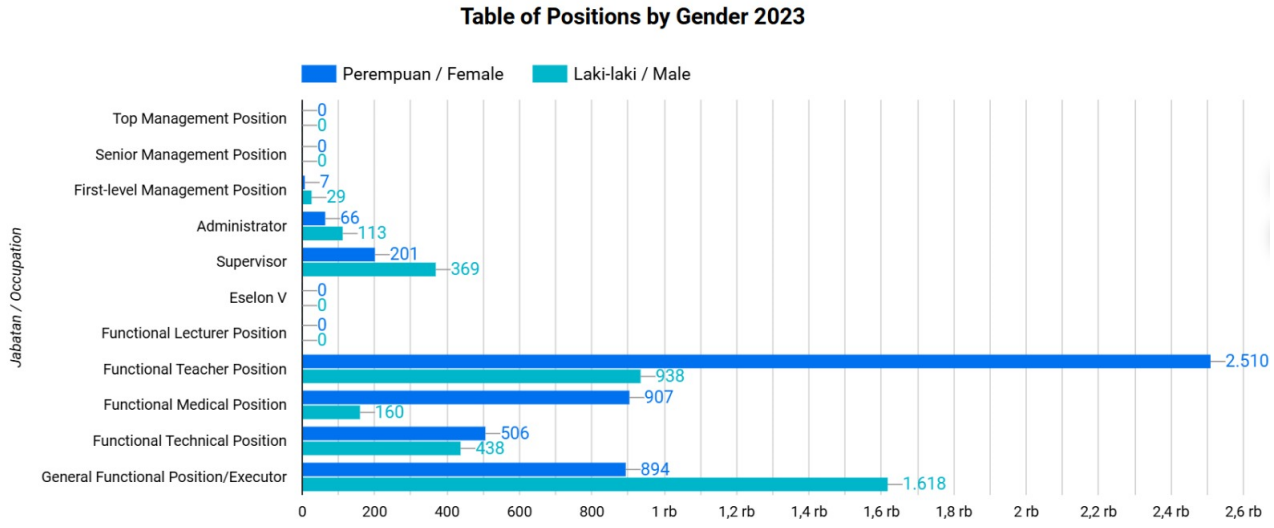

Figure 3. Visualization of Position Job Data According to Gender

The data visualization presented in Figure 3. positions according to the gender of civil servants in Bekasi City in 2023 results in an analysis that the functional position of teacher has a very high number of female employees, the medical functional position has more women than men, while in technical functional positions, men and women are relatively balanced. In supervisory positions, there is a dominance of men,

indicating that supervisory positions are filled by more male employees than women. In Echelon V positions, the distribution between men and women is more even. Administrator positions and high leadership positions (main, middle, pratama) have a relatively small number of employees compared to other positions. Senior and middle management positions are filled more by men, indicating that high leadership positions are more often held by men. The underlying reason for filling some positions by gender is that professions such as teaching are often more associated with women due to social perceptions of empathy and nurturing abilities that are more suitable. In contrast, supervisory or administrative positions tend to be filled by men, perhaps because they are often considered more suitable for leadership roles based on old stereotypes. Implications for the Bekasi City government's HR policies include increasing the 10% representation of women in supervisory and administrative positions within 2 years by creating training or capacity building that encourages women to take on roles outside of their traditional fields, thereby increasing gender diversity in certain positions which will affect the quality of decision-making as gender-diverse team members tend to be more innovative and effective [32].

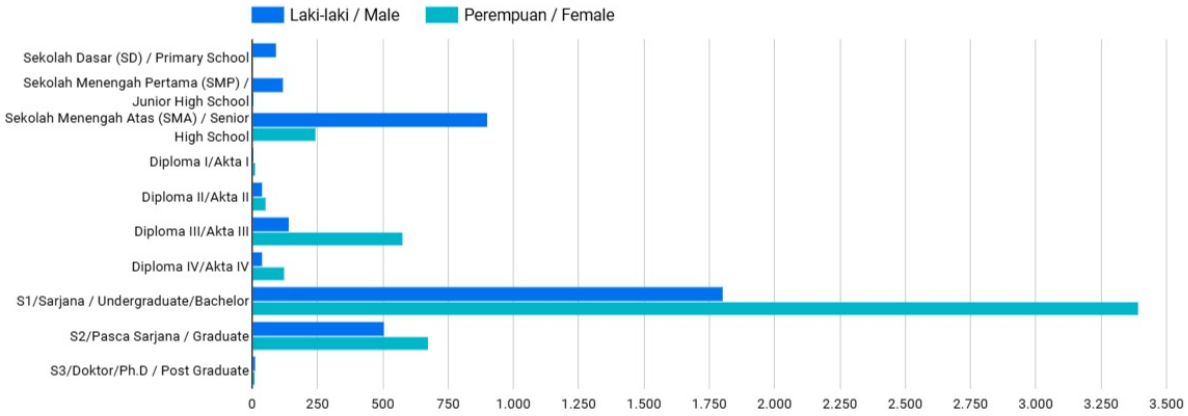

Figure 4. Visualization of the Number of Civil Servants in Bekasi City Based on Education

From Figure 4. visualization graph of the number of Civil Servants (PNS) in Bekasi City based on education level in 2023, the results of the detailed analysis are that undergraduate education is the most common qualification for civil servants in Bekasi City. Of this figure, women dominate with 3,394 people, compared to 1,805 men. Civil servants with a master's degree, there are 1,180 civil servants, who are also dominated by women compared to men. At the S3 education level, the number of civil servants is relatively small, namely 21 people, with a distribution that is slightly more men than women. This visualization shows that most civil servants in Bekasi City have a minimum qualification of S1, the underlying causes include the regulation of civil servant recruitment targeting candidates with a bachelor's education to meet the demands of modern work and improving the quality of services and the shift from administrative work to knowledge-based work causing a decrease in demand for workers with lower education or diplomas [33]. The implications for human resource policies for Bekasi City include the number of only 5% at the S2 or S3 education level requires an increase in education to support the optimization of human resources for strategic positions by conducting further training through scholarship programs for civil servants who want to continue their education to a higher level.

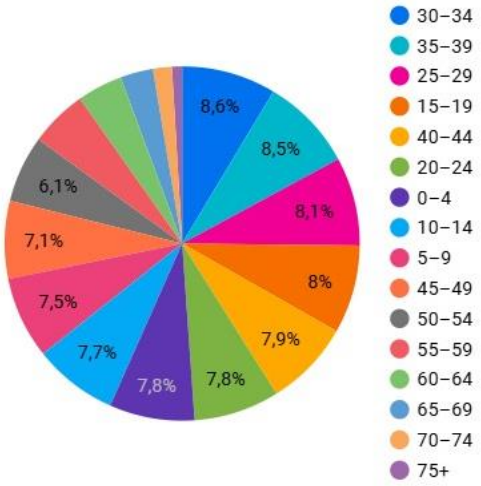

Figure 6. Population Data Visualization by Age Group per Year 2023

Pie chart Figure 6. regarding the population in Bekasi City based on age groups in 2023, the results of the detailed analysis are that the largest age group is in the range of 30-34 years. This shows that the productive age population in the range of 30s is the largest part of the population. The productive age (15-64 years) dominates the population, especially in the age group 25-44 years. The three largest age groups after 30-34 years are 35-39 (223,607 people), 25-29 (213,555 people), and 40-44 (207,025 people). The high number of productive age population can be a great potential for economic development, provided that it is accompanied by increased employment opportunities and HR capacity development programs such as job training and entrepreneurship programs. A fairly large number in the age group of children and adolescents, namely in the age range of 0-14 years, totaling around 591,558 people (a combination of age groups 0-4, 5-9, and 10-14 years). This indicates the need for educational facilities, child health, and other infrastructure that support the growth and development of the younger generation. The elderly age group (65 years and above) has a relatively small number. The population in the 65–69 age group is 78,236 people, 70–74 is 44,429 people, and 75 years and above is 26,841 people. Although the number is small, the increasing life expectancy indicates the need for attention to special health services for the elderly and adequate social security. In general, gender distribution is quite balanced across age groups.

3.3. Validation with chi-Square test

The Chi-Square test is used to evaluate the accuracy of the data in the dashboard and ensure that decisions made based on the data are justified and relevant for decision making.

Table 2. Results of Validation with Chi-square Test

Data Type	Null hypothesis (H_0)	Chi-Square	Critical Chi-Square	Degrees of Freedom (df)	Result	Summary
Distribution of Civil Servants Based on Education	There is no significant difference between the distribution of civil servants based on education in the dashboard and BPS external data.	5.32	7.815	3	H_0 is accepted	There is no significant difference between the distribution of civil servants based on education in the dashboard and BPS external data.
Position Data Based on Gender	here is no significant difference between the distribution of positions by gender in the dashboard and external data.	8.48	9.488	4	H_0 is accepted	here is no significant difference between the distribution of positions by gender in the dashboard and external data.
Population data by age	There is no significant difference between the distribution of population by age on the dashboard and BPS data.	3.606	5.991	2	H_0 is accepted	There is no significant difference between the distribution of population by age on the dashboard and BPS data..

Based from Table 2, in the type of data distribution of population based on age groups, the H0 decision is accepted, namely that the Google Looker Studio dashboard visualization is consistent with official data from BPS, then the distribution of civil servants based on education results in the H0 decision being accepted, namely describing the actual situation without bias, and the distribution of job data based on gender results in the H0 decision being accepted, namely showing a significant pattern and not a coincidence.

3.4. Insight for Bekasi City

Strategies that refer to community needs, regional potential, and technological developments based on dashboard visualizations and explanations in the previous paragraph. Some relevant insights to increase the capacity of human resources in supporting city development include data on the number of Bekasi City civil servants, the majority have a Bachelor's level of education (S1) and there is potential to increase the number of human resources with higher education levels (S2 and S3) by providing scholarships for civil servants and the community to continue their education to S2 and S3 levels, collaborating with local and international universities to provide educational programs that are relevant to the needs of the city, providing competency-based training as needed, such as information technology, public management, or entrepreneurship and encouraging employees to take professional certifications in their respective fields such as financial management, urban planning. Collaborate with the private sector to fund and implement HR development programs.

Bekasi City as a metropolitan area requires human resources who are ready to face the challenges of digitalization . Strategies that can be carried out are digital training by providing digital literacy programs for all levels of society, including civil servants, to improve adaptability to technology [34]. Integration of technology in the workplace by implementing digital platforms such as Looker, Google Workspace, or AI-based applications to improve the work efficiency of civil servants. Building technology training centers or coworking spaces to support the development of local startups and technology-based UMKM [35].

The education distribution of civil servants in Bekasi City shows that most employees have high school and diploma levels. Their competencies need to be improved according to the demands of the task. Strategies that can be carried out are competency mapping by mapping the competencies of existing human resources to understand their strengths and weaknesses. Upskilling and reskilling programs by providing upskilling training in areas such as city management, environmental management, transportation, and public health. Reskilling for employees whose roles are being replaced by automation and setting measurable key performance indicators (KPIs) and conducting periodic evaluations.

Population data shows that the productive age group (20-40 years) is quite dominant, indicating a large potential workforce. Strategies that can be carried out include facilitating entrepreneurship training for the younger generation. Encourage participation in creative sectors such as tourism, digital economy, and culture. Strengthen UMKM by providing training for UMKM players to expand markets, including exports and access to funding for local businesses through micro credit programs [36].

The large population and varied human resources demand attention to physical and mental health. Strategies that can be carried out include holding health programs, routine health checks for civil servants and residents. Awareness campaigns on mental health in the workplace, increased facilities, improved health facilities and health benefits for employees [37].

The level of education and the number of civil servants distributed need to be managed more efficiently. Strategies that can be carried out include rotating and rearranging the distribution of human resources to better suit the needs of each sector or sub-district. Utilization of data analytics technology for needs-based HR planning and cooperation with schools or universities to provide internship programs in government.

Bekasi City as an urban area faces environmental challenges that require the participation of human resources. Strategies that can be done are providing environmental education such as training and campaigns on waste management, energy saving, and greening the city. Green city management programs by involving the community in activities such as greening or environmental conservation.

Human resource capacity building in Bekasi City can be optimized to support the development of a more competitive, inclusive, and technology-based city by carrying out the suggested strategies. Strengthening collaboration and partnerships by engaging communities, local organizations and NGOs to improve the social and cultural capacity of citizens. A combination of education, technology, health, and cross-sector collaboration are key to achieving this goal.

4. Conclusion

This research shows that the application of human resource (HR) capacity data visualization using Google Looker Studio provides significant benefits in understanding and improving city capacity. Through interactive and data-driven visualization, government and stakeholders can more easily identify HR patterns, trends, and needs in various city sectors. Google Looker Studio, as a Business Intelligence tool, is able to present complex data into informative graphs and dashboards, which accelerate the decision-making process and enable more targeted policies.

The application of data visualization in HR analysis also helps identify skills gaps, uneven workforce distribution, and more specific training needs. This allows for more efficient HR management and supports sustainable long-term planning. In addition, data visualization provides transparency in reporting city HR performance, facilitates evaluation, and encourages accountability at every stage of policy planning and implementation. Thus, Google Looker Studio can be considered an effective solution in maximizing HR potential to achieve increased city capacity. Recommendations from this research include further research can use GIS technology for interactive data visualization by region, implement an automated system for real-time data-based reporting and recommendations so that in cases of lack of gender diversity, a minimum quota for gender representation at the level of high leadership or supervisory positions can be set, to ensure a more equitable distribution.

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