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MANAGEMENT | RESEARCH ARTICLE

Clustering of ICT human resources capacity in the implementation of E-government in expansion area: a case study from pali regency

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Abstract: The implementation of E-Government innovation has the ability to help the government reduce costs, enhance quality, save time, and improve the effectiveness and efficiency of the public services. Penukal Abab Lematang Ilir Regency is one of the new expansion areas has been implemented e-government to provide information and public transactions. However, the limited number and low quality of Human Resources in Information and Communication Technology (ICT) department are hampering the success of the innovation. Therefore, this study aims to measure the readiness of ICT human resources in implementing E-Government. This is conducted through the adoption of the Resource-Based View (RBV) to measure and cluster the capacity of ICT human resources based on three indicators which were Technical Capability, Management Capability, and Integrity. Moreover, these indicators are measured using the Gap Analysis method. The results obtained from 120 samples showed the mean striking gap for technical capability under Expertise (3.46) to be 2.65 and management ability under Organization (3.8) to be 2.18 where



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PUBLIC INTEREST STATEMENT

Under the rapid growth of e-government development in Indonesia, there are several inequality issues between e-government development and IT human resources capability to provide public services quality. This is because there is a limited number and low quality of Human Resources in Information and Communication Technology department hampering the success of the innovation in adopting e-government. Therefore, this study aims to measure the readiness of ICT human resources in implementing E-Government. This is conducted through the adoption of the Resource-Based View (RBV) to measure and cluster the capacity of IT human resources based on three indicators which were Technical Capability, Management Capability, and Integrity. the novelty of this research is the level of readiness of IT human resources capability in PALI Regency that can be utilized to place the suitability of resources with the required capabilities and criteria.

both were categorized as unprepared. This indicates that Penabab Abab Lematang Ilir District in South Sumatra needs to improve its Technical and Management Capabilities in implementing E-Government.

Subjects: Business, Management and Accounting; Management of Technology & Innovation; Human Resource Management

Keywords: E-government; resource-based view; gap analysis; human resources

1. Introduction

The Internet has been observed to accelerate the development of Information and Communication Technology (ICT) to change the values and culture of a society (Antoni, Pratiwijoi et al., 2018). The utilization of this potential in everyday life determines the progress of a country (Alghamdi et al., 2011). Therefore, every country seeks to implement ICT infrastructure such as E-Government to reduce costs, improve quality, save time, and improve the effectiveness and efficiency of the public sector services (Alshehri & Drew, 2010).

Penukal Abab Lematang Ilir (PALI) Regency is a New Autonomous Region/*Daerah Otonomi Baru* (DOB) established and regulated through Law Number 7 of 2013 concerning the Establishment of the PALI Regency in the Province of South Sumatra. It is one of the largest oils and gas producers in Indonesia. However, to provide public-oriented government system, the quality of public services was improved through the use of online information systems based on Presidential Instruction No. 3 of 2003 concerning National Policy and Strategy for E-Government Systems Development and the Presidential Regulation No. 95 of 2018 concerning electronic-based government systems.

To improve electronic-based services in PALI Regency, the local government has currently implemented several e-Government applications such as e-procurement (LPSE), Regional Offices Agency Systems (BKD), Regional management information systems (SIMDA), and others as well as other innovations in electronic-based services like siMaya that used as a communication channel between government agencies in the district (Murtado, 2017). However, the implementation of e-Government in this area is often problematic. For example, the regional site (www.palikab.go.id) temporarily closed on 10 April 2019, due to late payment of hosting services (Tamtu, 2019). Therefore, there is a need for local government and stakeholder readiness in managing e-Government. This is important because the government, as an actor, needs to be able to measure the level of readiness in the implementation of E-Government through indicators such as availability of infrastructure, strategic plans, regulations, as well as competent Human Resources which is an important role in the process.

Many theories and approaches have been developed to measure the readiness of ICT human resources in implementing and developing e-Government. Pederson (2016) in the research entitled "e-Government in regional government: challenges and Capabilities" revealed that regional government must have human resources in the field of Engineering (software engineering) and management (IT management). Furthermore, Ndou (2004) clustered the capability of ICT human resources in e-Government for developing countries into three groups and they include technological, commercial, and management. Bwalya (2009) stated that the government needs technical capabilities to run and develop e-Government in order to produce efficient public service delivery. Besides, Alghamdi et al. (2011) and Basu (2004) revealed that IT human resources need high personality and responsibility to achieve the targeted objectives. Moreover, the implementation and development of e-Government require three IT human resources capabilities and they include technical, managerial, and integrity. Managerial capability is the process of aligning the implementation and utilization of IT resources to support government strategic objectives (Antoni, Akbar et al., 2018). Technical capability is the ability of IT human resources to increase IT

effectiveness in integrating all business processes. While integrity is the personality and responsibility of HR in conducting their duties.

This paper aims to investigate the readiness of IT human resources in adopting e-government in PALI Regency through IT capabilities including Technical, managerial, and integrity capability. IT capabilities of IT human resources are identified and developed based on Resource-Based View (RVB) theory to address a critical research area that has not received any attention by academic research. The paper offers research findings for practitioners especially PALI Regency government to benchmark their readiness initiatives and progress in engaging with IT human resources. The researchers also can utilize the research findings to understand the significant issues including the drivers, values, and capacities of IT human resources in implementing e-government in expansion regency.

Based on the explanation above, this study provided an integrated framework to measure the readiness of e-Government implementation in PALI Regency from the perspective of IT human resources. The rest of the paper is organized as follows: section two gives a brief discussion of related literature to develop a conceptual framework, section three deals with the description of the research methodology, section four shows research finding and discussion, and finally, the last section concentrates on the conclusion.

2. Literature review

2.1. E-government di Kabupaten Penungkal Abab Lematang Ilir

Penabab Abab Lematang Ilir (PALI) is a New Autonomous Regency/Daerah Otonomi Baru (DOB) established and regulated through Law Number 7 of 2013 concerning the Establishment of the PALI Regency in the Province of South Sumatra. It is one of the largest oils and gas producers in Indonesia.

After the enactment of the Penukal Abab Lematang Ilir Regency Regulation No. 6 of 2016 concerning the Organizational Structure of the Penukal Abab Lematang Ilir Regency, several quality E-Government applications were implemented by the PALI Government for improving service quality to the community and citizen. An example of e-government application that has been implemented is the Regional Information System (SIMDA) which is a system that is required every Regional Work Agency (OPD). SIMDA consists of financial SIMDA, SIMDA goods, and SIMDA documents. In addition, there are also several Information Systems that are implemented based on the requirement of every OPD, for example, the Regional Financial and Asset Management Revenue Service (DPPKAD) has a system to record and payroll employees both Civil Servants and also recipients of awards. In the OPD, the Regional Human Resources Agency (BKD) has a Personnel Management application system that supports BKD and stakeholders in making decisions related to staffing in the PALI Regency. In IT infrastructure perspectives, there are 30 OPDs have been connected through several internet providers such as Astinet Fiber Optic Telkom and the Vsat satellite transmitter.

Although the PALI government has several e-government applications and Internet infrastructure, there is a need to manage and develop e-government in order to improve the services of the PALI government to the community. It is required the readiness of reliable ICT human resources. By empowering reliable ICT human resources readiness, the government is able to obtain and maintain competitive advantage supported by the skills and knowledge of ICT human resources. Therefore, this research will identify the readiness of ICT human resources capabilities in PALI Regency by using the Resource-Based View (RBV) theory.

2.2. Resource-based view

Resource-based Analysis View (RBV) is one of the popularly competitive theories. It was developed by Wernerfelt (1984) who emphasized the ability of competent resources in making it easy for

organizations to gain and maintain a competitive advantage. The existence of complex capabilities, skills, and knowledge allows organizations to control the activities and use of assets. Bharadwaj (2000) reported that organizational capacity created through the interaction of resources enables an organization to conduct several business processes or activities to achieve competitive advantages. Therefore, the main objective of the RBV is to identify the resources and capabilities needed by an organization to gain a competitive advantage.

Adopting the RBV theory, researchers have identified several types of abilities in organizations. For example, Kettinger et al. (1994) reported that an organization's ability to achieve advantages is determined by Information Technology (IT) infrastructure. Moreover, Bharadwaj (2000) stated that IT capabilities are organizational capabilities created through the interaction between IT infrastructure, human resources, and intangible assets to improve organizational performance. Tippins & Sohi (2003) also reported that IT capabilities are the ability of organizations to use resources to improve performance. In addition, the RBV categorizes strategic alignment as a valuable internal asset in a private and government agency, which is the basis for increasing profitability.

2.2.1. *Technical capability*

Based on the discussion above, IT human resource technical skills have the ability to help organizations integrate IT and improve business process effectiveness (Dale Stael & Muhanna, 2009). It can also enhance the efficiency of communication between business units through an effective application (Bharadwaj, 2000; Schneidermeyer, 2011). Technical capability is determined by (1) basic knowledge systems including the ability of IT human resources to prepare user documentation and develop flexible information systems effectively, (2) expertise in the implementation of information systems such as databases, modular programs, and IT infrastructure, and (3) ability to identify IT in the business process and resolve problems through it (Ravichandran & Lertwongsatien, 2005).

2.2.2. *Managerial capability*

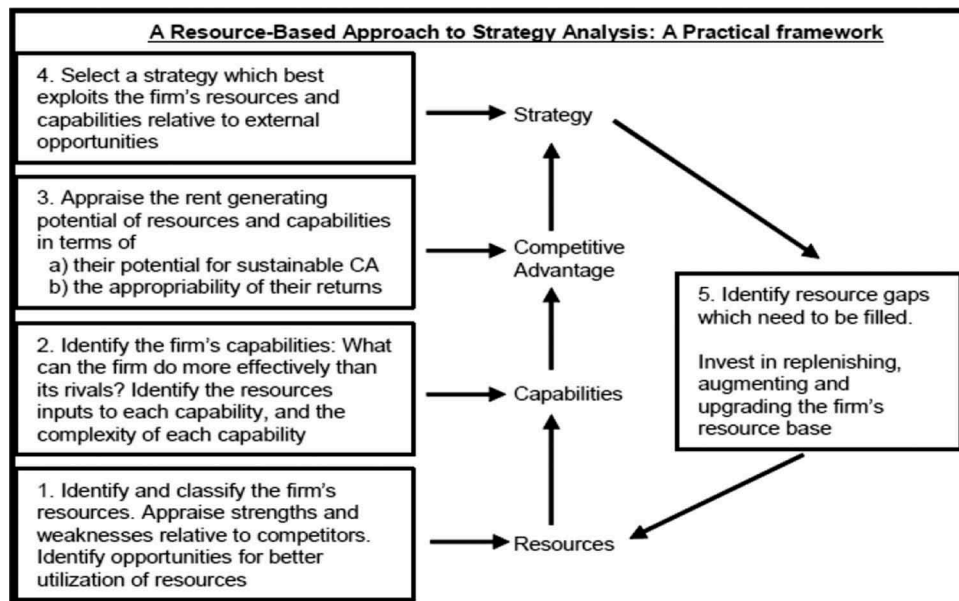
Many studies have identified the role of managerial capabilities of IT human resources in improving organizational performance. Karimi et al. (2007) found IT human resources to support an agency's business processes by managing and redesigning business operations to improve efficiency. Here, managerial skills consist of people, organizations, and performance. The people must be able to communicate and interact well with non-IT people or stakeholders. Speshock (2010) stated that IT human resources must be able to communicate with stakeholders to understand and identify the systems they build and also to identify and eliminate issues experienced. Furthermore, the organizational aspects include identification of key issues in an organization, determining the impact of IT use, and understand the culture of the organization. (Ravichandran & Lertwongsatien, 2005). Last, managerial capabilities are determined by the performance of ICT human resources in solving business problems and mastering multiple technologies.

2.2.3. *Integrity capability*

In RBV, the capabilities of IT personnel are considered as unique skills, competencies, and knowledge needed to provide IT services (Byrd & Turner, 2000). However, integrity is a benchmark for their qualifications based on honesty, consistency, and/or responsibility towards work (A. H. Huang, 2009; Shropshire et al., 2006). The following is a statement made to determine the technical capabilities of IT HR in general. This ability is related to the personality of IT HR who is responsible for the confidentiality of data and information contained in information systems. Besides, integrity is also related to legal knowledge regarding documentation of information systems in the district and city with respect to procedures and authorization of access to data and information (L. K. Huang, 2010).

Figure 1 shows the stages of the RBV process to include (1) Identification and classification of organizational resources based on the strengths and weaknesses of the organization and identifying opportunities for utilization. (2) Identification of organizational capabilities by understanding

Figure 1. RBV process (Grant (Grant, 2002)).



the competitive strategy, resource use, and complexity of each action. (3) Identification of the potential of the resources to obtain sustainable competitive advantage and its impact. (4) Determination of the best strategy to utilize resources. (5) Suitability between resources and position/condition of the organization.

2.3. Gap analysis paradigm

This is used in determining the gap between the actual and expected performance (Antoni, Fikari et al., 2018; Maxted et al., 2008; Mittal & Cane, 2016). It involves the determination of the steps to be taken to move from one condition to another. According to Maxted et al. (2008), it measures (1) difference between current and future operational activities (known as Current Gap Vision), and (2) difference between actual activities and theoretical targets (A Delta T/Actual Gap Target).

Maxted et al. (2008) found the steps involved in implementing Gap Analysis to include selection and determination of the activities to be analyzed, review of activity information and determination of the important aspects of the activity as indicators of performance measurement, determination of the vision/target of future activities, comparison of the gap degree, determination of the actions needed to meet the target, and analysis of the comparison results.

Based on this theory, the gap analysis was conducted to identify the actions needed to reduce the gap or to achieve the expected performance in the future by estimating the costs, time, and resources available. The PALI government made the respondent's answer to IT HR as the actual activity (A) and the stakeholder's response as the target activity (T).

The flow of the research is formulated as follows based on the review of scientific journals, conferences, and previous studies:

Figure 2 shows that the fundamental variables to be technical capability, management capability, and integrity capability. The focus of this research was on the Public Service Information System implemented by the PALI Government. The scenario frameworks based on Figure 2 are as follows:

Figure 2. Research flow.

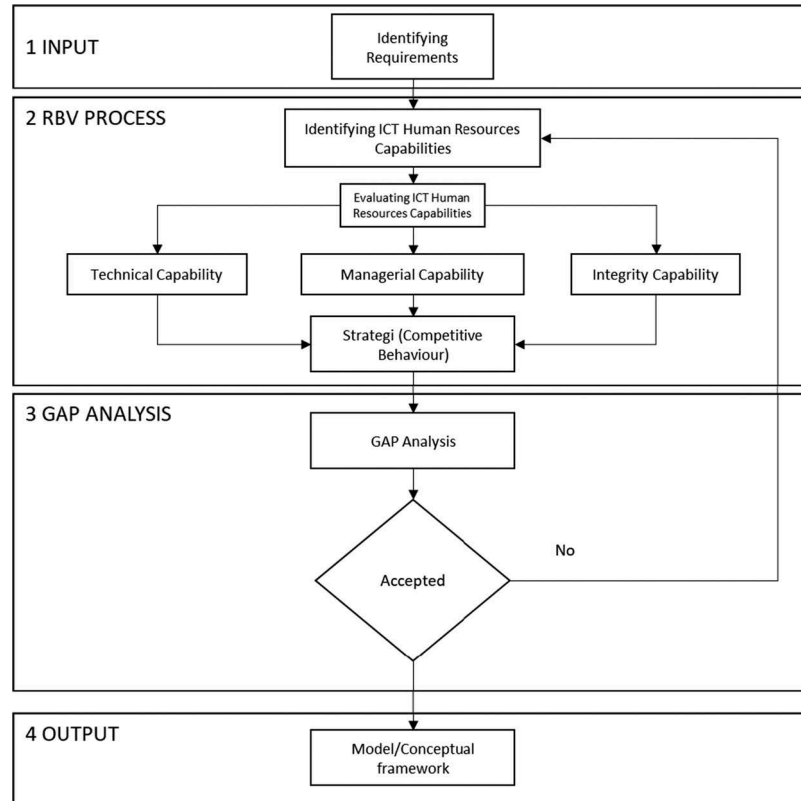
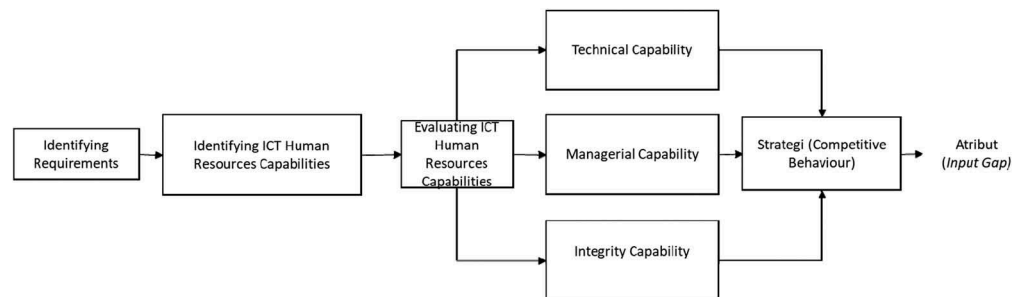


Figure 3. Modeling readiness using RBV.



- (1) Collecting requirements by identifying the availability of resources to determine the direction and objectives of the organization.
- (2) Identifying potential and competitiveness, one of which is measured by the IT HR.
- (3) Measuring IT HR readiness based on technical capabilities, management capabilities, and integrity to produce several strategies.
- (4) Choosing the right strategy to support IT HR in helping organizations based on competitive behavior.
- (5) Evaluating IT HR readiness to find the most suitable potential and competitiveness towards the needs of the organization to be used as indicators.
- (6) Modeling compatibility between HR and ICT needs and the results used as a reference for the PALI Government’s strategic plan.

Table 1. Respondent profile

Respondent characteristics	Description
1.Age	20 to 40 years old
2.Education	Senior high school at minimum
3. Position	Operator/manager of an application system

Table 2. Rating scale for positive and negative statements (Sugiyono, 2017)

No	Description	Positive scores	Negative scores
1	Strongly agree	5	1
2	Agree	4	2
3	Less Agree	3	3
4	Disagree	2	4
5	Strongly Disagree	1	5

Table 3. Readiness category

No	Scales	Categories
1	0–1,00	Really Ready
2	1,01–2,00	Ready
3	2,01–3,00	Not really ready
4	3,01–4,00	Not ready
5	4,01–5,00	Really not ready

3. Research methodology

A study of conceptual literature and Quota sampling was conducted to measure the readiness of the PALI Regency in implementing e-Government from the perspective of IT human resources. Quantitative research method is used in this research. Bryman and Bell (2007) and Sekaran and Bougie (2010) described that a quantitative method is a research method that employed data in the form of numbers and statistical analysis. Quantitative method is used, when the problems deviate from expected results and the facts, between planning and proceeding, between theory and practice, between plan and implementation.

The population was divided into two groups which include (1) the actual respondents consisting of Civil Servants/Pegawai Negeri Sipil (ASN) and Non-Civil Servants/Non-Pegawai Negeri Sipil (Non-ASN) Information Systems operators or managers in the PALI District Government; and (2) The targeted respondent consisting of all stakeholders in the District Government such as the Regent, Deputy Regent, Regional Secretary, or Head of the Communication and Information Agency/Dinas Komunikasi dan Informatika (Diskominfo). Moreover, 25% of the population was involved in the research through the use of Quota sampling method (Battaglia, 2008). This approach was found by Battaglia (2008) to be one of the non-probability methods where the primary selection criteria are related to the ease in obtaining specific samples in a certain number which is also related to the cost of placing elements of the population, geographical distribution of samples, and obtaining interview data from selected elements.

There are 480 civil servants and non-civil servants who are responsible for managing information systems but only 120 representing 25% of the total were used as a sample. Moreover, the sample

used for the target respondents was determined by the Head of the Communication and Information Agency as shown in table 1.

Based on the data and information obtained, a qualitative analysis was conducted using the Resource-Based View (RBV) method by identifying the technical ability, management ability, and integrity (Janowski, 2016) to get the best strategy that satisfies the needs of IT human resources in implementing E-Government. While the quantitative made use of Gap analysis to obtain statistical information.

The RBV method was used to obtain attributes from each indicator of the research variable and the gap between the actual and targeted activities was calculated based on the frequency distribution of the answers of the IT human resources respondents (actual) and stakeholders (targets) using the following formula:

$$\text{Weight} = \text{Avg Score} \times \text{Score} \quad (1)$$

$$\text{Avg weight} = \text{Total Weight} / \text{Number of scores} \quad (2)$$

$$\text{Gap} = \text{Avg Target Weight} - \text{Avg Actual Weight} \quad (3)$$

Moreover, the profile information obtained from the respondents is as follows:

The questionnaires were distributed and analyzed using the RBV methods and the business process of the theory was configured as follows:

Table 2 shows that a Likert scale was used to measure the quantitative data through the determination of the interval size before the gap was analyzed.

To facilitate data processing, each likert scale variable was converted to the readiness interval range category as shown table 3. The conversion was used to simplify the analysis and calculation of the mean of each variable.

Description:

4. Findings and discussions

Observations and interviews showed that the Penukal Abab Lematang Ilir District as of August 2017 had 1,474 civil servants and 4,331 non-civil servants. Of these, there were 46 IT HR civil servants and 434 IT HR non-civil servants. Besides, there are 30 Regional Apparatus Organizations/Organisasi Perangkat Daerah (OPD) with each having at least two IT operators/managers. The data collected from 30 OPDs showed several application groups as shown in Table 4.

Table 4 shows that three application groups have been implemented in all OPDs and they include development such as LPSE, SIRUP, TEPRRA, Financial like SIMDA, and Government groups. However, the profile of the respondents is as follows:

Table 5 shows that there are more male than female respondents while observations reveal that companies need more male workers than women due to a large number of physical jobs. Moreover, the majority of the respondents are 41–50 years old and have more years of service and experience than young employees. Most of them are scholars and considered to have ideas and innovations to advance the company.

The research data were obtained from a questionnaire with 38 items of statements obtained from 30 respondents. The highest score was 5 and the lowest was 1. The data obtained were

Table 4. Application system group used by OPD

No	Application groups	System names	OPDs
1	Service	i-SISMIOP, SIAK, SAPA, Perizinan Online	Bapenda, Disdukcapil, Diskominfo, DPMTSP
2	Administration and Documents	Sisdokumen, SISPPD	All OPDs
3	Legislation	JDIH, SIMWASDAL	Legal Section, Inspectorate and BKPSDM
4	Development	LPSE, SIRUP, TEPRRA	ULP, all OPDs
5	Finance	SIMDA Keuangan	All OPDs
6	Staffing	SIMPEG, SAPK, SIS-DAPODIK	BKPSDM, Disdik
7	Governance	SIMPADA, SIMDA Barang	BPKAD, All OPDs
8	Community	INA-CBG	RSUD

Table 5. Respondent profiles

No	Types	Characteristics	The number of respondents	Percentage
1	Gender	Male	103	85.83%
		Female	17	14.17%
		Total	120	100%
2	Age	<20	0	0%
		20-25	23	19.16%
		26-30	59	49.16%
		31-40	38	31.67%
		>40	0	0%
	Total	120	100%	
3	Last education	Senior high school	11	9.17%
		Diploma	24	20%
		Undergraduate	85	70.83%
		Graduate	0	0%
		Total	120	100%
4	Educational Discipline	Computer	41	34.17%
		Non-computer	79	65.83%
		Total	120	100%

analyzed using SPSS v.21 to find the mean of each indicator for the 5 dimensions and the frequency distribution is presented in the following tables:

Table 6 shows that the mean of each indicator for five dimensions was determined by dividing the total value obtained by the number of assessment criteria. The mean shows the value of readiness according to categorization. Table 7 shows the frequency distribution of target readiness

Table 6. Frequency distribution of actual readiness

Score	Technical ability			Managerial ability			Integrity	
	Basic Knowledge	Expertise	Competence	Organization	People	Performance	Personality	Responsibility
1	4.25	32.50	0	0.00	0.00	0.00	0.00	0.00
2	43.50	42.50	41.00	121.00	81.00	54.67	0.00	0.00
3	223.50	124.5	111.00	102.00	97.50	150.00	118.50	180.00
4	54.00	99.00	236.00	54.00	60.00	98.67	272.00	214.00
5	30.00	0.00	17.50	60.00	32.00	90.00	62.50	32.50
Total	355.25	298.50	405.50	337.00	398.50	393.33	453.00	426.50
Mean	71.05	59.70	81.10	67.40	79.70	78.67	90.60	85.30

Table 7. Frequency distribution of target readiness

Score	Technical ability			Managerial ability			Integrity	
	Basic Knowledge	Expertise	Competence	Organization	People	Performance	Personality	Responsibility
1	5.25	48	0	0	0	0	0	0
2	43.5	51.2	73	123	91	66.67	0	0
3	233.5	104.5	109	78	98.5	142	174.1	122
4	54	99	166	73	100.3	95.67	191	217
5	32	13.1	67	82	112	98	94.5	99.3
Total	368.25	315.8	415	356	401.8	402.34	459.6	438.3
Mean	73.65	63.16	83.00	71.20	80.36	80.47	91.92	87.66

The gap value was obtained by knowing the value of the current actual and expected readiness and finding the difference between them. The gap indicates the direction of improvement/development to be followed or the minimum increase required by the company to reduce the gap value. However, five gaps were discovered in this study and they are as follows.:

Table 8 shows that the gap results from the survey conducted on the Penukal Abab Lematang Ilir Government with the analysis as follows:

As can be seen in figure 3, the first process was the RBV Input regarding the availability of Information Technology Infrastructure, Human Resources, and E-Government implementation regulations. The second process was the competitiveness of Human Resources in the field of Information Technology (IT HR), and the measurement of their technical abilities, managerial abilities, and integrity.

For the technical abilities covering information technology knowledge obtained from formal education and its relevance, expertise in office, database, network, programming, and design, as well as basic knowledge of software and hardware management, 50% responded in agreement that the HR has good technical abilities and able to compete (Hernikawati & Sensuse, 2016; Susanto, 2016) .

For the managerial abilities, 44.27% agreed there is a need for the HR to understand the main tasks and functions according to standard operating procedures, be able to work together, lead, and present data and information to others. It was, however, concluded that HR has managerial abilities and can compete (Susanto, 2016).

For integrity, 56.46% agreed HR requires honesty, responsibility, authority, and orderly administration, and this shows HR has integrity and ability to compete (Hernikawati & Sensuse, 2016; Susanto, 2016).

The next process was the determination of the appropriate strategy. Three variable indicators were observed to have been fulfilled by the IT HR in the District of Penukal Abab Lematang Ilir and they include technical abilities, managerial abilities, and integrity. The final stage produced the input gap analysis and process attributes to evaluate strategies through the use of gap analysis method. The input gap attributes found include (1) Technical abilities such as Basic Knowledge, Expertise, and Competence (2) Managerial abilities including Organization, People, and Performance, and (3) Integrity including Personality and Responsibility.

Process attributes are those in each indicator used to determine the gap value by calculating the average value of the respondent's answer multiplied by the weight of the predetermined score. This was, however, divided into actual and target. Moreover, after getting the actual and target mean values, the gap between the two was calculated and the degree of readiness was determined by the match between the category and the score interval.

5. Conclusion

From the results and discussion above, it can be concluded that readiness factors were measured using indicators of technical ability consisting of basic knowledge, expertise, and competence, managerial ability consisting of organization, people and performance, and integrity which includes personality and responsibility. Moreover, a gap of 2.65 and 2.18 was discovered for technical and managerial abilities and this indicates "not really ready" category for the IT HR. The highest values of 3.49 and 3.8 were observed for expertise and organization attributes, respectively, and it was discovered that the modeling of the IT HR perspective measurement can be conducted using Resource-Based View (RBV) method and Gap Analysis.

Furthermore, clustering the ICT human resources capacity has significant implications to the creation of public policy initiatives in e-government implementation, such as ICT policy for government has

Table 8. Comparison of readiness and gap analysis

Score	Technical ability			Managerial ability			Integrity	
	Basic Knowledge	Expertise	Competence	Organization	People	Performance	Personality	Responsibility
Actual	71.05	59.70	81.10	67.40	79.70	78.40	90.60	85.30
Target	73.65	63.16	83.00	71.20	80.36	80.47	91.92	87.66
Gap	2.6	3.46	1.9	3.8	0.66	2.07	1.32	2.36
Mean	KS	TS	S	TS	SS	KS	S	KS
Category	Not really ready			Not really ready			ready	
		2.65			2.18			1.84

specified the necessary steps to be taken by local government agencies to improve their IT human resources capacity and skill. The government's leader in PALI regency should also make efforts to minimize the gap between each dimension through investing a lot of money to make improvements by building a strong network infrastructure, adding servers with high data processing capabilities and replacing the computer device in accordance with the needs of the system.

This study has presented that the clustering of IT human resources capacities in PALI Regency including technical, managerial, and integrity skills, which determine the level of readiness of IT human resources capacity. Therefore, there is a need for future research to investigate IT human resources capabilities from citizens and IT infrastructure perspectives to promote the sustainable the implementation of e-government, which is the ultimate purpose of each e-government development.

Therefore, the Penukal Abab Lematang Ilir Government should use a pattern of needs analysis to place the suitability of resources with the required capabilities and criteria. Further research is recommended to determine the level of readiness of IT infrastructure in the District.

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