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The Effect of PDCA Cycle on Service Quality, Innovation Capability, and Work Performance of Indonesian Private Universities

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ABSTRACT

The main objective of this research is to analyze the practical and strategic effects of the implementation of the plan, do, check, action (PDCA) cycle on innovation capabilities, work productivity, and service quality of private univeristies. The number of incoming and valid questionnaires was 243 samples. Data processing using the SEM method with SmartPLS 3.0 software. From the results of data analysis, it can be seen that all hypotheses are accepted, indicating that the implementation of the PDCA cycle concept has a positive and significant effect on innovation capabilities, work productivity, and service quality. Innovation capabilities and employee work productivity also have a positive and significant effect on service quality. Another important point is that innovation capability and work productivity have a positive and significant effect as a mediator on the influence relationship between the PDCA cycle and service quality. This study proposes a model to improve the service quality of private universities through increasing and strengthening the application of the PDCA cycle concept through innovation capabilities and work productivity as a mediator.

1. Introduction

One of the conditions facing the world of higher education in Indonesia today is competition issues that are local, regional and global in nature. College at Indonesia, whether it has a public or private status, does not only compete with Local universities but also various institutions which are a network of Higher education at the international level. Service quality in the form of various services provided by institutions, especially to external and internal customers / clients is important, the only important indicator of achievement in educational services is customer satisfaction (Sallis, 2011) in realizing quality in the academic field as output. To be able to compete with other universities, among others, is to improve the quality of service in the academic field, the services provided by the college are not only given to students as the main external customers but lecturers and employees as internal customers must also services are provided by universities, starting from human resource development through further studies, seminars, training, facilities and infrastructure for teaching and learning process activities, welfare, security, administrative services, attention from the leadership. According to Kotler (2009), service quality must start with customer needs and end with customer satisfaction and positive perceptions of service quality. Quality of Higher Education Academic Services is a measure of how much good for the overall excellence or privilege of the level of service provided by the tertiary institution so that it can meet the needs / wants of customers (main external and internal), as well as the accuracy to balance or match customer expectations. Zeithaml, Berry, and Parasuraman (2008) identify five dimensions related to service quality, the five dimensions of service quality of the ServQual model. The five are presented sequentially based on their importance according to customers, which includes: (1) Reliability, this dimension includes the ability of the company / institution to provide accurate service from the first time without making any mistakes and deliver its services according to the agreed time. (2) Responsiveness this dimension includeswillingness and ability of employees to help customers and respond to their requests, as well as informing when services will be provided and then provide services quickly. (3) Assurance, this dimension includes employee behavior that is able to foster customer trust in the company / institution and the company / institution can create a sense of security for his customers. This assurance means that employees are always courteous and have the knowledge and skills required to handle any customer question or problem. (4) Empathymeans company / institution understand the problems of its customers and willingness / act in the interests of customers, and give

personal attention to customers and have comfortable hours of operation. Such as the ease of contacting companies / institutions, employees 'ability to communicate with customers; and the company's efforts to understand its customers' wants and needs. (5) Display of physical / Tangible elements, this dimension includes the availability of the appearance of physical facilities, equipment, human resources, materials for communication which are tangible evidence (Tangible) of service. Educational institutions grow and develop as befits the service industry, and every time it changes along with the globalization process, therefore it needs to be marketed and oriented towards students as one of the institution's customers, and that is consistent with the marketing interests of the education sector industry. According to Kartajaya (2006, 234), the most effective promotion is through word of mouth. Customers who are satisfied will be a spokesperson for a product more effectively and convincingly than any kind of advertising. This kind of satisfaction is impossible without excellent service. According to Arasli et al. (2005) related to service quality shows that there are positive findings of service quality forming dimensions (consisting of Reliability, Assurance, Tangible, Emphaty, and Responsiveness) on the level of customer satisfaction which can affect the development of positive word-of-mouth about the company. Positive word-of-mouth that develops in society is often associated with satisfaction levels consumers after consuming a product or service. Student satisfaction is very important in the higher education sector in relation to its role as a service industry. Hence evaluating perceptions students to their satisfaction that they experience and hope that universities, colleges, institutes as institutions of higher education should continue to do so. Service quality measures can also serve as management tools. Brown and Koenig (1993) recommend thatevaluation of customer satisfaction with the quality of education should be an integral part of the Total Quality Management (TQM) program in business education. A better understanding of how consumers shape the impression quality can provide valuable information to management to design service systems that improve customer satisfaction (Seymour,1992) and to adapt the university environment to the needs of students (Hampton, 1993). Service quality improvement programs must take the customer into account, because management may make erroneous assumptions about customer assessments of service quality.

The problem is the extent of the influence of the application of the PDCA on innovation capabilities, work productivity, and service quality. Where the three variables above are important components for efforts to improve

the sustainable competitiveness of private universities. Several previous studies analyzed the effect of applying the PDCA cycle on service quality, the effect of the PDCA cycle on work productivity, and the effect of the PDCA cycle on innovation capabilities. However, no research has been found that comprehensively analyzes the effect of implementing the PDCA cycle on service quality through innovation capabilities and employee work productivity as a single research model. Therefore, this *research gap* is considered important and critical to be analyzed more deeply so that in turn, comprehensive knowledge is obtained and has an impact on policymaking by the leaders of private universities.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

As mentioned earlier, the PDCA cycle is a safety net towards the effectiveness and efficiency of the production process. Not only that, the PDCA cycle is a stimulant for the emergence of organizational competitive advantages such as innovation, productivity, and performance (MN Dudin et al., 2017).

PDCA (Plan-Do-Check-Action)

PDCA is a model for making continuous improvements by planning, doing, checking, and taking action (Heizer & Render, 2005). The PDCA cycle is generally used to test and implement changes to improve the performance of a product, process, or system in the future. PDCA is very suitable for use for small-scale continuous improvement activities to shorten the work cycle, eliminate waste in the workplace, and productivity.

First, Plan: identifying and analyzing problems. At this stage, you can use some useful tools such as Drill Down, Cause and Effect Diagram, and 5 Whys to help you find out what the problem is. Once you have identified it, you can map the process. Furthermore, you can describe all other information needed to assist you in issuing a solution. According to Prasetyawati (2014) the steps in planning for improvement include: (1) determining priority problems, (2) setting targets, (3) looking for causes of problems, (4) arrange corrective steps (Prasetyawati, 2014).

Second, Do: Develop and test potential solutions. This phase has several activities including issuing possible solutions. Choosing the best solution. (can use Impact Analysis techniques). Implement temporary solutions in small-scale case examples first (trial) At this stage, your actions have not been fully implemented. Maximum implementation occurs at the stage *Act*. According to Prasetyawati (2014), at the stage *Do* steps or improvement implementation activities are carried out.

Third, Check: Measuring how effective the previous solution was tested and analyzing whether the step could be improved. In this phase you will measure how effective the temporary solution you have made, then you can

collect information from all parties concerned to work together to make the solution even better. If you still don't see clear results, you can try to repeat the Do stage to re-check again. After you are satisfied with what you have achieved, then you can move on to the next stage (final). According to Prasetyawati (2014), at the stage, *Check* activity evaluation steps or activities are carried out.

Fourth, Act: Implementing the improved solution thoroughly. In this process, the solution implementation is carried out thoroughly. However, the use of PDCA does not end here, if using PDCA as a form of initiation of continuous improvement, the process can repeat this cycle by returning to the initial stage *(plan)* and repeating all these stages in sequence so that the system achieves stability and increases gradually. According to Prasetyawati (2014), at this stage of the *Act* standardization steps or activities are carried out.

Innovation Capability

Anning-Dorson (2016) suggests that innovation in service companies can come from multiple sources and service companies seek innovation from within their operations; from the market (external environment) and customers (Anning-Dorson, 2016). Innovation is the practical application of an idea into a new product or process. Innovation is a condition in goods and services, even ideas that are considered new (Mansury & Love, 2008). The innovation capability is considered a valuable asset for the company to provide and maintain a competitive advantage and in the implementation of all strategies. It is structured through the main processes in the company (Lawson & Samson, 2001). The innovation capability facilitates companies to introduce new products quickly and adopt new systems, but it is important to factor in to feed ongoing competition. Innovation performance can be described as a combination of assets and resources. Therefore a wide range of resources, assets, and capabilities is needed to drive through success in a rapidly changing environment (Raja Pathirana & Hui, 2018b). According to Rajapathirana & Hui (2017) innovation capability is defined as (1) the capacity to develop new products that meet market needs; (2) the capacity to apply appropriate process technology to produce these new products; (3) the capacity to develop and adopt new products and processing technology to meet future needs; (4) and the capacity to respond to deliberate technology activities and unforeseen opportunities created by competitors.

Work Productivity

Managing a project and managing operations and production are closely related to the term productivity. The productivity indicators cannot be separated from the input (*input*) and output (*output*). What is meant by *input* in productivity can be in the form of resources used such as capital, labor, materials (materials), and energy, while the *output* can be in the form of the number of product units or the income generated. A measure of productivity

is usually expressed by a ratio that compares the *output* to the *input* used in the production process (*output per input unit*).

Productivity is a concept that describes the relationship between the results (the number of goods and or services produced) and the sources (the amount of labor, capital, land, energy, etc.) to produce these results (Greenberg, 1973). Meanwhile, according to (Van, 2009) states that simply productivity is a computational comparison between the amount produced and the amount of each source used during production. The sources referred to can be land, raw and auxiliary materials, machinery and tools, labor. Furthermore, in more detail, (Mansury & Love, 2008) argues that productivity can be interpreted as a concrete result (product) produced by individuals or groups, during a certain time unit in a work process. In this case, the higher the product produced in a shorter time, it can be said that the level of productivity has a high value and vice versa. The following are some of the factors that affect the productivity of an organization, namely: technical factors, production factors, organizational factors, personnel factors, financial (financial) factors, management factors, government factors, location factors.

In general, according to Sinungan (2000), productivity measurement is in four types, namely: First, the quality of work which can be seen in terms of work accuracy and tidiness, speed of work completion, skills, and work skills. Second, the quantity of work that can be seen from the quantitative ability to achieve targets or work results for new jobs. Third, compliance with the standards set by the company which can be seen from the ability and reliability in carrying out its duties both in implementing regulations and initiatives and discipline. Fourth, efficiency in work which can be seen from the ability to use time in completing the work set by the company (Greenberg, 1973; Sinungan, 2005). Measuring work productivity as a means to analyze and encourage production efficiency. Another benefit is to determine targets and uses, in practical terms as a standard in the payment of employee wages. To measure productivity, two types of human working hours can be used, namely the working hours that must be paid and the working hours that must be used for work.

Service Quality

The era of globalization and the rapid development of information technology has had a tremendous impact on economic activity. Changes occurred that was fast-paced and had implications for the domestic and international economy. Competition from various industrial sectors has become increasingly sharp, requiring management expertise to deal with the changes that occur. So that the company can continue to grow and develop, the company must always increase its competitive advantage. Nowadays quality is an important issue in the business world, many companies pay more attention to the quality of goods and services produced. Quality is one of the company's operating objectives and the responsibility the company

carries. Especially in the service or service sector, companies will consider policies regarding the importance of service quality. The higher the level of service quality, the higher the customer satisfaction.

Quality of service is a performance that can be offered by one person to another. This performance can be in the form of intangible actions and does not result in ownership of any goods and to anyone (Kotler & Lee, 2008). The main point is that service is an action taken by a seller to the buyer/consumer to meet the needs and desires of consumers. This behavior aims at achieving customer satisfaction. A service can be performed when consumers choose a product or after completing a product purchase transaction. Good quality service will also have a good impact on the company because it will be a loyal customer and provide benefits for the company. Service quality in this study uses five indicators adapted from (Parasuraman et al., 1988), namely: (1) ease of ordering products, (2) fast and responsive in responding to consumer needs, (3) being responsible for product quality, (4) ease of returning products that are not following consumer desires, (5) products are easy to find in the market.

The Effect of the Application of the PDCA Cycle on Innovation Capabilities, Work Productivity, and Service Quality

The PDCA cycle was proposed by (Shewhart, 1931, 1939), and is generally used as a problem-solving model in the context of quality management (Deming, 2000). According to this framework, the quality of improvement will be effective if the improvement starts with a plan (P), good activities required to achieve the plan are implemented (i.e., completed, D), results are checked (C) understand the causes of the results, and action (A) is taken. to improve the process (Dahlgaard et al., 1995). This study focuses on the PDCA cycle because this model is a gradual problem-solving model (Choo et al., 2007). Commonly used problem-solving process models consist of: (1) problem definition; (2) problem analysis; (3) generation and selection of solutions, (4) testing and evaluation of solutions; and (5) development of new routines (MacDuffie, 1997). In particular, problems are identified and analyzed during the planning stage, solutions are implemented during the implementation phase and evaluated in the checking phase, and new routines are developed in the implementation phase. Other researchers have proposed a workplace problem-solving cycle consisting of design, implementation, evaluation, and assessment (O'Connor, 2004). Although this cycle is very similar to the PDCA Cycle, the PDCA model is more practical and has been applied not only in quality but also in project management (Srivannaboon, 2009). Based on the discussion above, the researcher estimates that PDCA practices affect innovation capabilities, work productivity, and service quality in the workplace by facilitating problem-solving. The use of the PDCA cycle practice can facilitate the acquisition, sharing, and institutionalization of new knowledge and skills that are useful for improving the competitiveness of the company sustainably. Therefore, the researcher proposes the following hypothesis:

H1: PDCA cycle practices have a positive and significant effect on innovation capabilities
H2: PDCA cycle practices have a positive and significant effect on work productivity
H3: PDCA cycle practices have a positive and significant effect on service quality

The Effect of Innovation Capability and Work Productivity on Service Quality

Innovation capabilities facilitate companies to apply the right process technology to develop new products that meet market needs and eliminate the threat of competition (Rajapathirana & Hui, 2018a). It helps to shape and manage the various capabilities of the company to support successfully integrating capabilities and the stimulus for innovation. Superior innovation capabilities tend to be able to implement and develop new product variations for the existing product portfolio (Dadfar et al., 2013). Rajapathirana & Hui (2017) explained that companies must improve their leadership, people, partnerships, and organizational capabilities before the implementation of the initial process of innovation and new product development. Several studies have concluded that innovation capability is the capacity of a company to develop new products through a combination of innovation behavior, strategic capabilities, and internal technological processes (Bhat & Momaya, 2020; Vicente et al., 2015). Research results prove that innovation capabilities and work productivity affect service quality (Ngo & O'Cass, 2013; Roth & Jackson III, 1995). Based on the description above, the first hypothesis of this study is as follows:
H4: Innovation capability has a positive and significant effect on service quality
H5: Work productivity has a positive and significant effect on service quality

The Effect of the PDCA Cycle on Service Quality through Mediation of Innovation Capabilities and Work Productivity

It is admitted that not many studies have explored the effect of the practice of implementing the PDCA cycle on service quality by making the innovation capabilities and employee work productivity variables as mediators. While research on the effect of implementing the PDCA cycle on service quality has been quite a lot and has been discussed in the previous section (Abadi et al., 2019; Chiarini, 2011; M. Dudin et al., 2015; Ngo & O'Cass, 2013). Such as the effect of the application of the PDCA cycle on service quality in the retail sector (Chiguvi, 2016), in the public sector (Al-Ibrahim, 2014), in the field of education (Li et al., 2014), in the health sector (Taylor et al., 2014)) and so forth. Therefore, the researcher proposes a new hypothesis in this study, namely:
H6: PDCA cycle practices have a positive and significant effect on service quality through the mediation of innovation capabilities.

H7: PDCA cycle practices have a positive and significant effect on service quality through mediating work productivity.

Research Concept Framework

According to (Sekaran & Bougie, 2003) the theoretical framework is the foundation on which all research projects are based. From the theoretical framework can be formulated hypotheses that can be tested to determine whether the theory formulated is valid or not. Then further it will be measured by appropriate statistical analysis. Referring to previous theory and research, there is an influence relationship between the following variables: the application of the PDCA cycle, innovation capabilities, work productivity, and service quality. For this reason, the authors build a research model as follows:

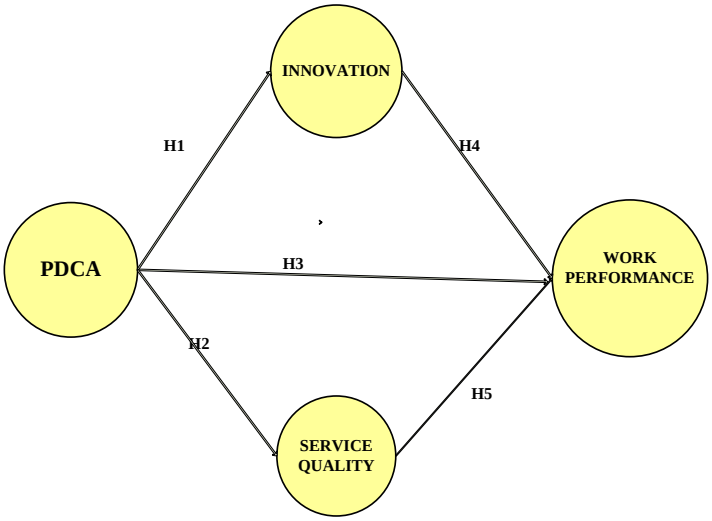

Figure 1. Research Model

Note: The figure is derived from the output of the SmartPLS 3.0 (authors, 2020)

3. METHODS

Operational Definition of Variables and Indicators

The method used in this research is the quantitative method. Data was collected by distributing questionnaires to 243 lectures of private universities. The instrument used to measure the application of the PDCA cycle was adapted from (Matsuo & Nakahara, 2013) by using 5 items (X1-X5). The innovation capability was adapted from (Rajapathirana & Hui, 2018b) by using 3 items (Z1.1-Z1.3). Work productivity uses 4 items (Z2.1-Z2.4) by adapting instruments from (Greenberg, 1973; Sinungan, 2005). Service quality uses 5 items (Y1-Y5) adapted from (Parasuraman et al., 1988). The list of variables and items is mentioned in Table 1. The questionnaire is designed closed except for questions/statements regarding the identity of the respondent in the form of a semi-open questionnaire. Each closed question/statement item is given five answer options, namely:

strongly agree (SS) score 5, agree (S) score 4, neutral (N) score 3, disagree (TS) score 2, and strongly disagree (STS) score 1. The method for processing data is by using PLS and using *software* SmartPLS version 3.0 as *its tool.*

Sample Description

Table 1. Descriptive Sample Information

Criteria		**Number**
Age (as of September 2020)	≤ 30 years	118
	31 - 40 years	103
	41 - 50 years	18
	≥ 51 years	4
Work experience	1 - 5 years	131
	6-10 years	83
	> 10 years	29
Education	≤ Senior High School	190
	Diploma Degree	17
	Bachelor Degree	36

Note: The respondent profile table is derived from a summary of the questionnaire returned (authors, 2020)

Test Results of the Validity and Reliability of Research Indicators

The measurement model testing phase includes testing for convergent, validity discriminant validity. Meanwhile, to test the construct reliability, *Cronbach's alpha* and *composite reliability were used*. The results of the PLS analysis can be used to test the research hypothesis if all indicators in the PLS model have met the requirements of convergent validity, discriminant validity, and reliability testing.

Convergent Validity Testing

Convergent validity test is done by looking at the value *loading factor* of each indicator against the construct. In most references, a factor weight of 0.5 or more is considered to have sufficiently strong validity to explain latent constructs (Chin, 1998; Ghozali, 2014; Hair et al., 2010). In this study, the minimum limit for *loading factor accepted* is 0.5, provided that the AVE value of each construct is> 0.5 (Ghozali, 2014). Based on the results of SmartPLS 3.0 processing, after items that do not meet the

requirements are discarded, in Figure 2 and Table 3, all indicators have a value *loading factor* above 0.7. So thus, the convergent validity of this research model has met the requirements.

Table 2. Items Loadings, Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE)

Variables	Items	Loadings	Cronbach's Alpha	Composite Reliability	AVE
PDCA Cycle (X)	X1	0.727	0.833	0.883	0.601
	X2	0.828			
	X3	0.804			
	X4	0.764			
	X5	0.750			
Innovation Capability (Z1)	Z1.1	0.877	0.825	0.895	0.741
	Z1.2	0.859			
	Z1.3	0.845			
Work Productivity (Z2)	Z2.1	0.883	0.885	0.921	0.747
	Z2.2	0.925			
	Z2.3	0.884			
	Z2.4	0.754			
Service Quality (Y)	Y1	0.817	0.881	0.913	0.677
	Y2	0.850			
	Y3	0.821			
	Y4	0.863			
	Y5	0.760			

Note: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Discriminant Validity Testing

Discriminant validity is done to ensure that each concept of each latent variable is different from other latent variables. The model has good *discriminant validity* if the AVE square value of each exogenous construct (the value on the diagonal) exceeds the correlation between this construct and other constructs (values below the diagonal) (Ghozali, 2014). The results of testing *discriminant validity* using the square AVE value, namely by looking at the Fornell-Larcker Criterion Value are obtained as referred to in Table 4. The discriminant validity test results in table 4 above show that all constructs have a square root value of AVE above the correlation value with the construct. other latency, through the Fornell-Larcker criteria, so

that it can be concluded that the model has met the discriminant validity (Fornell & Larcker, 1981).

Moreover, collinearity evaluation is done to discover whether there is collinearity in the model. To find out about collinearity, VIF estimation from every construct is required. If the VIF score is higher than 5, then the model will show collinearity (Hair et al., 2014). It is shown the same way as in Table 5, all VIF scores that are less than 5 means that the model has no collinearity.

Construct Reliability Testing

The construct reliability can be assessed from *Cronbach's alpha value* and the *composite reliability* of each construct. The recommended *composite reliability* and *Cronbach's alpha* value is more than 0.7 (Ghozali, 2014), you can use a measure of one of them. If the value *composite reliability* is above 0.7, then it is sufficient (Ghozali, 2014). The reliability test results in table 3 above show that all constructs have a value *composite reliability* greater than 0.7 (> 0.7). In conclusion, all constructs have met the required reliability.

Hypothesis test

Hypothesis testing in PLS is also known as the inner model test. Hypothesis testing in this study includes testing the significance of direct effects and measuring the influence of exogenous variables on endogenous variables. The effect test was carried out using the t-statistic test in the analysis model *partial least square* (PLS)using the *software* SmartPLS 3.0. With the technique *bootstrapping*, the obtained *R Square* value and the value are significance test as shown in the table below:

Tabel 3. Discriminant Validity

Variables	X	Y	Z1	Z2
X	**0.775**			
Y	0.755	**0.823**		
Z1	0.751	0.702	**0.861**	
Z2	0.458	0.510	0.453	**0.864**

Note: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Tabel 4. Collinearity Statistics (VIF)

Variables	Y	Z1	Z2
	1.979		
X	2.390	1.000	1.000
Z1	2.377		
Z2	1.311		

Note: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Tabel 5. *R Square* Value

	R Square	R Square Adjusted
Y	0.654	0.652
Z1	0.564	0.563
Z2	0.210	0.208

Note: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Tabel 6. Hypotheses Testing

Hypotheses	Relationship	Beta	SE	T Statistics	P-Values	Decision
H1	X→Z1	0.751	0.027	28.019	0.000	Supported
H2	X →Z2	0.458	0.043	10.717	0.000	Supported
H3	X → Y	0.523	0.051	10.245	0.000	Supported
H4	Z1 → Y	0.235	0.057	4.142	0.000	Supported
H5	Z2 → Y	0.164	0.037	4.470	0.015	Supported
H6	X →Z1 → Y	0.176	0.045	3.965	0.000	Supported
H7	X → Z2 → Y	0.075	0.019	3.922	0.000	Supported

Note: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Based on Table 5 above, the value of *R Square* for service quality (Y) is 0.654 which means that the variable service quality (Y) can be explained by the variable application of the PDCA cycle (X), innovation capability (Z1),

and employee work productivity (Z2) of 65.4 %, while the remaining 34.6% is explained by other variables not discussed in this study. The value of *R Square* innovation capability (Z1) is 0.564, which means that the innovation capability variable (Z1) can be explained by the PDCA cycle application variable (X) of 56.4%, while the remaining 43.6% is explained by other variables not discussed in this study. The value *R Square* of employee work productivity (Z2) is 0.210 which means that the employee work productivity variable (Z2) can be explained by the PDCA cycle application variable (X) of 21.0%, while the remaining 79.0% is explained by other variables not discussed in this study. Meanwhile, Table 6 shows the *T Statistics* and *P-Values* that show the influence between the research variables that have been mentioned.

The results of data analysis indicate that the application of the PDCA cycle has a positive and significant effect on innovation capabilities. Evidenced by the t-statistics value of 28.019, greater than 1.96, and a p-value of 0.000 less than 0.05. Because the effect is positive, the conclusion is that the H1 hypothesis is accepted. So, it can be concluded that there is a positive and significant effect of the application of the PDCA cycle on innovation capabilities. The application of the PDCA cycle has a positive and significant effect on employee work productivity. Evidenced by the t-statistics value of 10.717, greater than 1.96, and a p-value of 0.000 smaller than 0.05. Since the effect is positive, the conclusion is that the H2 hypothesis is accepted. So, it can be concluded that there is a positive and significant effect of the application of the PDCA cycle on employee work productivity. The application of the PDCA cycle has a positive and significant effect on service quality. Evidenced by the t-statistics value of 10.245, greater than 1.96, and a p-value of 0.000 smaller than 0.05. Because the effect is positive, the conclusion is that the H3 hypothesis is accepted. So, it can be concluded that there is a positive and significant effect of the application of the PDCA cycle on the quality of employee service to customers. Innovation capability has a positive and significant effect on service quality. Evidenced by the t-statistics value of 4.142, greater than 1.96, and a p-value of 0.000, less than 0.05. Because the effect is positive, the conclusion is that the hypothesis H4 is accepted. So, it can be concluded that there is a positive and significant impact of innovation capabilities on service quality. Employee productivity has a positive and significant effect on service quality. Evidenced by the t-statistics value of 4.470, greater than 1.96, and a p-value of 0.015 which is smaller than 0.05. Because the effect is positive, the conclusion is that hypothesis H5 is accepted. So, it can be concluded that there is a positive and significant influence on employee work productivity on service quality. The application of the PDCA cycle has a positive and significant effect on service quality mediated by the innovation capability variable. Evidenced by the t-statistics value of 3.965, greater than 1.96, and a p-value of 0.000 smaller than 0.05. Because the

effect is positive, the conclusion is that hypothesis H6 is accepted. The application of the PDCA cycle has a positive and significant effect on service quality that is mediated by employee work productivity variables. Evidenced by the t-statistics value of 3.922, greater than 1.96, and a p-value of 0.000 smaller than 0.05. Because the effect is positive, the conclusion is that hypothesis H7 is accepted.

Discussion

The Effect of the Application of the PDCA Cycle on Innovation Capabilities, Work Productivity, and Service Quality

Analysis of the data in the previous section shows that the application of the PDCA Cycle has a positive and significant effect on innovation capabilities, work productivity, and service quality. This fact is consistent with the results of research which states that the PDCA cycle has a positive and significant effect on innovation, employee work productivity, and service quality.

The Effect of Innovation Capability and Work Productivity on Service Quality

The data analysis above shows that the innovation capabilities and work productivity of employees have a positive and significant impact on service quality. Service quality is the most crucial part and a differentiating factor between one company and another. Competitive advantage is felt to be increasingly necessary to build sustainably so that companies can exist in the era of industrial revolution 4.0 which necessitates a unique and significant advantage.

The best competitive advantage in a business is very much dependent on the defense of the company's unique resources and skills. The position of *competitive advantage* that can is the key to survive long-term business performance superiority. Position of *advantage* strong will create value that is perceived by customers higher than others and can create relatively low costs and ultimately drive the achievement of job differentiation, which is supported by *skills* market-oriented and company resources. Competitive advantage is a dynamic process, so it must be done on an ongoing basis. Competitive advantage illustrates that a company can act better than other companies even though they operate in the same industrial environment (Hasan, 2008). The better the *intellectual capital and* innovation capabilities of the company's employees, the higher the competitiveness (Jose & Gonzales, 2012). The ability to innovate is very important to create competitive advantage (Larsen & Lewis, 2007), the ability to innovate can increase competitive advantage (Parkman et al., 2012).

The Effect of the PDCA Cycle on Service Quality through Mediation of Innovation Capabilities and Work Productivity

The fact obtained from the results of data analysis in the previous section shows that the application of the PDCA Cycle has a positive and significant effect on service quality through the mediation of the innovation capability

and work productivity variables. This fact is following the results of research which state that the PDCA cycle has a positive and significant effect on quality. service through the mediation of innovation capability variables and work productivity PDCA is a feedback cycle in which a planned process responds to non-conformity, improvements, and all feedback as a result of the constructive evaluation to become materials for making further improvements in a continuous process. Feedback in the dynamics of organizational activities occurs at the smallest and individual process levels. Suppose an employee gets feedback in the form of an individual performance appraisal from his superior, gets a variety of inputs from people around him (colleagues, suppliers, customers), and can even be all information or input from various sources and facts in the field that lead to individual and organizational improvements. . This is the importance of the extent to which an individual responds to all input or feedback to improve himself and his performance. The continuous improvement feedback cycle which is the PDCA philosophy will be driven more effectively if it is responded well by individuals in responding not only to the scope of the work operation process but in all aspects that are an improvement for themselves and the organization.

In the perspective of work characteristics theory, feedback is defined as information that conveys how well or at the individual level the worker does his job, while from the perspective of goal setting theory, feedback is defined as information that conveys the most up-to-date progress that has been achieved on the target or goals that have been set (Colquitt & Wesson, 2009). This study found the fact that feedback from the PDCA cycle in terms of performance is an important factor in organizational change towards better performance.

4. CONCLUSIONS AND SUGGESTIONS

Conclusions

From the data analysis that has been done previously, it has been proven that the application of the PDCA cycle has a positive and significant effect on innovation capabilities, work productivity, and service quality. Likewise, innovation capabilities and employee work productivity have a positive and significant effect on service quality. Another important point from the conclusion of this study is that innovation capabilities and work productivity have a positive and significant effect on the influence relationship between the application of the PDCA cycle and service quality at private universities. Future studies should research other units of analysis, such as customers and suppliers. Likewise, development research can be carried out in other sectors such as education, social, and other public sectors. In future studies, it will be better to add and involve other relevant variables so that it will make research in this theme more complete and comprehensive.

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