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Framework Development for Transforming Multistakeholder Value Into Prioritized Business Processes Improvement in Higher Education Institutions (HEI)

Ig. Jaka Mulyana[1], Moses Laksono Singgih[2], Sri Gunani Partiwi[2*]

[1]*Widya Mandala Surabaya Catholic University (Indonesia)*
[2]*Institut Teknologi Sepuluh Nopember (Indonesia)*

jmulyono@ukwms.ac.id, moseslsinggih@ie.its.ac.id
[*]*Corresponding author: srigunani@ie.its.ac.id*

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Abstract:

Purpose: This paper seeks to develop a framework of multistakeholder value transformation into a business process improvement plan in Higher Education Institutions.

Design/methodology/approach: In this paper, data collection and analysis uses Questionnaires and fuzzy methods to obtain multistakeholder value and its importance weight. Transformation of multistakeholder value into priority business process improvement using an expert panel, adopting Quality Function Development and House of Risk.

Findings: This research has developed a framework consisting of two parts: the framework to transform the multistakeholder value into a Higher Education Institution's business process and the framework to determine the priority of improvements. A private university successfully applied the framework to find and prioritize business process improvement.

Research limitations/implications: The stakeholders used in this framework are students, lecturers, and employers. The results of this study are the order of priority for improving business processes. The future research opportunity is to develop a model to select business process improvement considering the probability of success, preferences, and costs. Another possibility of research is involving other stakeholders and using weighted averages to calculate the average fuzzy numbers.

Originality/value: Previous research on identifying the stakeholder value of Higher Education Institutions just involved one of the stakeholders. In addition, most objectives were to assess stakeholders' level of importance and satisfaction. This research develops a framework to identify multistakeholder values (students, lecturers, and employers) and transform them into a business process improvement plan for teaching, research and community service, student affairs, and supporting activities.

Keywords: framework, multistakeholder value, business process improvement

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1. Introduction

Lean Manufacturing and Six Sigma are complementary methods widely used in industries called Lean Six Sigma (Antony, 2015). Several researchers proposed Lean Six Sigma (LSS) framework in various industries, such as government (Furterer, 2004), health (Matteo, 2012), automotive (Kowang, Yong, Rasli & Long, 2016), education (Sunder & Antony, 2018), small medium enterprises (Moya, Galves, Muller & Camargo, 2019), and insurance (Sandner, Sieber, Tellermana & Walthes, 2020). Some researchers used LSS on HEIs for improved teaching, service administration, freshman registration processes, marketing, and research (Hess & Benjamin, 2015), to reduce waste in the teaching and learning process (Vats & Sujata, 2015), increase efficiency (Svensson, Anthony, Ba-Essa, Majed & Albliwi, 2015), increase student satisfaction rates, reduce consultation wait times by 15 percent and increase the number of registrants by five percent (Haerizadeh & Sunder, 2019), improving teaching methods, administrative processes, improving the quality of HEI and adding value that can continuously increase student satisfaction (Cudney, Venuthurumilli, Materla & Antony, 2018). However, applying LSS in HEI needs to be explored more (Haerizadeh & Sunder, 2019).

Identifying the expectations of HEI stakeholders is the first step in developing LSS. HEI stakeholders consist of several parties. According to Reavill (1998), HEI stakeholders comprised twelve: students, employers, student families, university leaders and employees, suppliers, high schools, other universities, industry, countries, governments, taxpayers, and professional organizations. Pereira and Silva (2003) argued that HEI stakeholders include students, student families, HEI owners, lecturers, communities/governments, and employees. Several researchers have identified the HEI stakeholder value, as seen in Table 1. Almost all research objectives identified and measured the level of expectations and satisfaction of stakeholders (Abbas, 2020; Dužević & Čeh Časni, 2015; Ku & Shang, 2020; Mcdowall, 2016; Sahney, 2011a,b; Sandmaung & Khang, 2013; Zhu & Sharp, 2021). Meanwhile, several other researchers identified the expectation of stakeholders and proposed improvements (Gonzalez, Quesada, Mueller & Mueller, 2011; Hwarng & Teo, 2001; Sahney, 2011b). However, the proposed improvement is only limited to one business process.

HEI's business process consists of several fields: teaching, research & community services, student affairs, and supporting activities. Most studies only identified student value. Research that identified multiple stakeholder values only to compare them. Meanwhile, based on Table 1, the paper's purpose was only to determine the stakeholders' perceptions. Because HEI stakeholders consist of several parties, it is necessary to identify the value of all stakeholders. After knowing it, the stakeholder value can be transformed into a business process improvement plan. HEI can satisfy stakeholders by knowing stakeholders' values and transforming to improve business processes.

Every organization, including HEIs, will face various risks that affect its business processes, so good risk management is needed to evaluate, control, and monitor each risk (Hopkin, 2010). According to Dale, Goldstein, Johnson, Mattie and Morley (2001), the Association of College and University Business Officers (NACUBO) defines risk as issues that affect an organization's ability to achieve its goals. Risk assessment is the process of evaluating and assessing the magnitude and likelihood of risk occurrence. Risk assessment aims to determine the risk rating as a basis for appropriate action, allowing the university to focus on managing significant risks (Sum, 2015). This paper discusses the development of a framework to identify the multistakeholder value of HEI and transform it into a business process improvement plan. The framework analyzes multistakeholder values and determines improvement priorities in teaching, research and community service, student affairs, and support activities. In the framework developed, the prioritization of business process improvements considers the possibility of risk occurrence.

2. Literature Review

2.1. Stakeholder Value of HEI

Stakeholder value is the perception of the value of a product or service to stakeholders. Value means whether stakeholders feel they get benefits and services from the product or service (Mahajan, 2020). Stakeholders will feel satisfied if they get the expected value. Muncy (2008) and Koris and Nokelainen (2015) argued that many factors at HEIs can determine student satisfaction, for example, curriculum, feedback, and student-lecturer relationship. Zineldin et al. (2011) identified student satisfaction factors based on the five dimensions of quality (5Qs) model

consisting of the quality of an object, the quality of a process, the quality of infrastructure, the quality of interaction, and the quality of atmosphere. Sahney (2011a) measured the importance level of student expectations using 26 questions grouped into five dimensions: competence, attitude, content, delivery, and reliability. Mcdowall (2016), in his research, used Ruffalo Noel Levitz's Student Satisfaction Inventory (SSI) to measure student satisfaction. The SSI consists of 79 statements to measure the performance of HEIs, which are grouped into 12, namely academic advising effectiveness, campus climate, campus support services, concern for the individual, instructional effectiveness, admissions and financial aid effectiveness, registration effectiveness, responsiveness to diverse populations, safety and security, service excellence, student-centeredness, and campus life. Ku and Shang (2020) measured teaching quality using 20 statements categorized into class management, teaching strategy, learning assessment, and course content. Research on student expectations was also conducted (Abbas, 2020). In his study, Abbas (2020) found that seven factors determine student satisfaction: teachers' profiles, curriculum, infrastructure and facilities, management and support staff, employment quality, safety and security, and students' skills development. Meanwhile, Gonzalez et al. (2011) and Rodman, Biloslavo & Bratož (2013) identified the expectation of employers. Rodman et al. (2013) analyzed importance level HEI quality dimensions consisting of the resources and inputs, value chain, sustainable development, and outcomes dimensions. Gonzalez et al. (2011) examined the level of importance of 24 employers' expectations. Several other studies have analyzed employers' perceptions and the importance of HEI graduates' soft skills (McMurray, Dutton, McQuaid & Richard, 2016; Štambuk, Karanović & Host, 2019; Succi & Canova, 2019).

No.	Author(s)	Stakeholder	Methods	Aim(s)
1	Hwarng & Teo (2001)	Students	Quality Function Deployment (QFD)	Identify student expectations and design lecture materials and methods
2	Zineldin, Akdag & Vasicheva (2011)	Students	Questionnaire	Investigate the factors that affect student satisfaction based on the dimensions of the quality, namely quality of the atmosphere, quality of infrastructure, quality of objects, quality of interactions, and quality of processes
3	Sahney (2011a)	Students	SERVQUAL	Assess student perceptions and expectations
4	Gonzalez et al., 2011	Graduate User	Questionnaire and QFD	Identify industry needs to design curricula
5	Sahney (2011b)	Students	KANO and QFD	Determine suggestions for improving services and designing the education service system
6	Sandmaung & Khang (2013)	Students, Lecturers, Managerial Staff, and Employers	Survey and Statistical Analysis	Compare the ranking of quality indicators according to students, lecturers, managerial staff, and employers.
7	Dužević & Čeh Časni (2015)	Students and Lecturers	ANOVA	Compare students' and faculty's perceptions of quality.
8	Mcdowall (2016)	Students	KANO	• Categorize academic services and campus life based on the five dimensions of KANO • Measure the importance of academic services and campus life
9	Ku & Shang (2020)	Students	KANO & Revised Importance Performance Analysis (RIPA)	• Categorize teaching quality based on 4 quadrants of KANO • Evaluation of teaching quality using RIPA
10	Abbas (2020)	Students	HEISQUAL	• Investigate the factors that determine HEI quality • Measure HEI quality levels
11	Zhu & Sharp (2021)	Students and Lecturers	Survey and Statistical Analysis	Compare HEI service quality from student and lecturer perspectives.

Table 1. HEI Stakeholder Value Identification and Analysis

Lecturers are very important and strategic educators, so lecturers' satisfaction at work will affect the quality of teaching and research. (Chen, Yang, Shiau & Wang, 2006; Tran & Do, 2020). In their research, Chen et al. (2006) grouped 39 attributes of lecturer satisfaction into six dimensions: Organisation Vision, Respect, Result Feedback and Motivation, Management System, Pay and Benefit, and Work and Environment. Sahney, Banwet and Karunes (2008) identified 19 quality attributes of HEI according to lecturers grouped into five dimensions: tangible, competence, attitude, delivery, and reliability. Tran and Do (2020) identified the factors that influence the work motivation of lecturers in Hanoi. In their research, 33 factors were identified which were grouped into 7: work characteristics, wage & welfare, social recognition, peer relationship, training & promotion opportunity, and leadership caring.

The shortcomings of the previous studies are that the studies only measured the perception or satisfaction level of students (Abbas, 2020; Ku & Shang, 2020; Mcdowall, 2016; Sahney, 2011a; Zineldin et al., 2011), graduate users (Gonzalez et al., 2011; McMurray et al., 2016; Rodman et al., 2013; Štambuk et al., 2019; Succi & Canova, 2019) or lecturers (Chen et al., 2006; Tran & Do, 2020). Whereas HEI stakeholders consist of many parties, including students, lecturers, employers, employees, and HEI leaders. For this reason, a study is needed to determine the value of all stakeholders. In addition to knowing stakeholder value, it is necessary to transform value into a business process improvement plan. Thus HEI can fulfill all of the stakeholders' expectations.

2.2. Fuzzy Quality Function Deployment (FQFD)

Quality Function Deployment (QFD) is a structural method for planning and developing a product or service. It is capable of identifying consumer wants and needs. QFD also evaluates proposed products or services to meet consumer wants (Ficalora & Cohen, 2010). The most critical step in using QFD is to determine and prioritize customer needs (Suef, Singgih, Sukwadi & Widawati, 2014). Translating consumer needs uses the House of Quality (HoQ) matrix. The basic idea of QFD is to translate the voice of the customer into finished products. Various industrial sectors, including manufacturing, transport, electronics, construction, services, and education, have used QFD (Sivasamy, Arumugam, Devadasan, Murugesh & Thilak, 2016).

HEI stakeholders have various needs. HEI stakeholder needs and technical characteristics cannot be clearly defined. For this reason, integrated QFD and fuzzy methods can be used to translate the various needs of HEI stakeholders. The application of fuzzy theory plays an essential role in developing QFD, especially if the data is subjective and qualitative. Fuzzy QFD enables decision-makers based on incomplete or uncertain information. In general, the fuzzy theory is used to create HoQ in determining the important level of consumer need and technical characteristics, the relationship between consumer need and technical characteristics, or between technical characteristics (Xu, Xu & Xie, 2010). By using fuzzy, the weight of each customer's needs and its relationship to the technical characteristics can be determined even with uncertain estimates and values (Haber, Fargnoli & Sakao, 2020). Fuzzy theory and QFD are effective decision-making methods and comparing customer needs in vague and uncertain situations (Sousa-Zomer & Miguel, 2017).

The fuzzy theory has been widely implemented in many problems in different areas. Fuzzy theory is used if variables and parameters are imprecise and uncertain. Because linguistic variables are not mathematically operable, each linguistic variable can be linked to a fuzzy number that describes the meaning of the general verbal word. Conversion scales are used to convert linguistic concepts into fuzzy numbers (Beheshtinia & Azad, 2019). A fuzzy set of numbers is developing a set of crisp numbers. A membership function expresses a fuzzy number set, a curve that shows the mapping of data input points into its membership value (membership degree) and has an interval between 0 to 1. Fuzzy membership consists of some approaches, including linear, trapezoidal, and triangular. Triangular Fuzzy Number (TFN) is one of the fuzzy value approaches noted as (*l, m, u*). Membership functions (*l, m, u*) are indicated in Equation (1).

$$\mu(x) = \begin{cases} \frac{x-1}{m-l}, & l \le x \le m \\ \frac{u-x}{u-m}, & m \le x \le u \\ 0, & otherwise \end{cases} \quad (1)$$

If $\tilde{L} = (l_1, m_1, u_1)$ and $\tilde{M} = (l_2, m_2, u_2)$ are two TFNs, then mathematical operations follow the Equations (2)-(6).

$$\tilde{L} + \tilde{M} = (l_1, m_1, u_1) + (l_2, m_2, u_2) = (l_1 + l_2, m_1 + m_2, u_1 + u_2) \quad (2)$$

$$\tilde{L} - \tilde{M} = (l_1, m_1, u_1) - (l_2, m_2, u_2) = (l_1 - u_2, m_1 - m_2, u_1 - l_2) \quad (3)$$

$$\tilde{L} * \tilde{M} = (l_1, m_1, u_1) * (l_2, m_2, u_2) = (l_1 * l_2, m_1 * m_2, u_1 * u_2) \quad (4)$$

$$\frac{\tilde{L}}{\tilde{M}} = \frac{(l_1, m_1, u_1)}{(l_2, m_2, u_2)} = \left(\frac{l_1}{u_2}, \frac{m_1}{m_2}, \frac{u_1}{l_2}\right) \quad (5)$$

$$\tilde{L}^{(-1)} = (l_1, m_1, u_1)^{(-1)} = \left(\frac{1}{u_1}, \frac{1}{m_1}, \frac{1}{l_1}\right) \quad (6)$$

3. Framework Development

The framework consists of two parts: the framework for translating multistakeholder value into business process-HEI and determining improvement priorities. The framework can be seen in Figure 1.

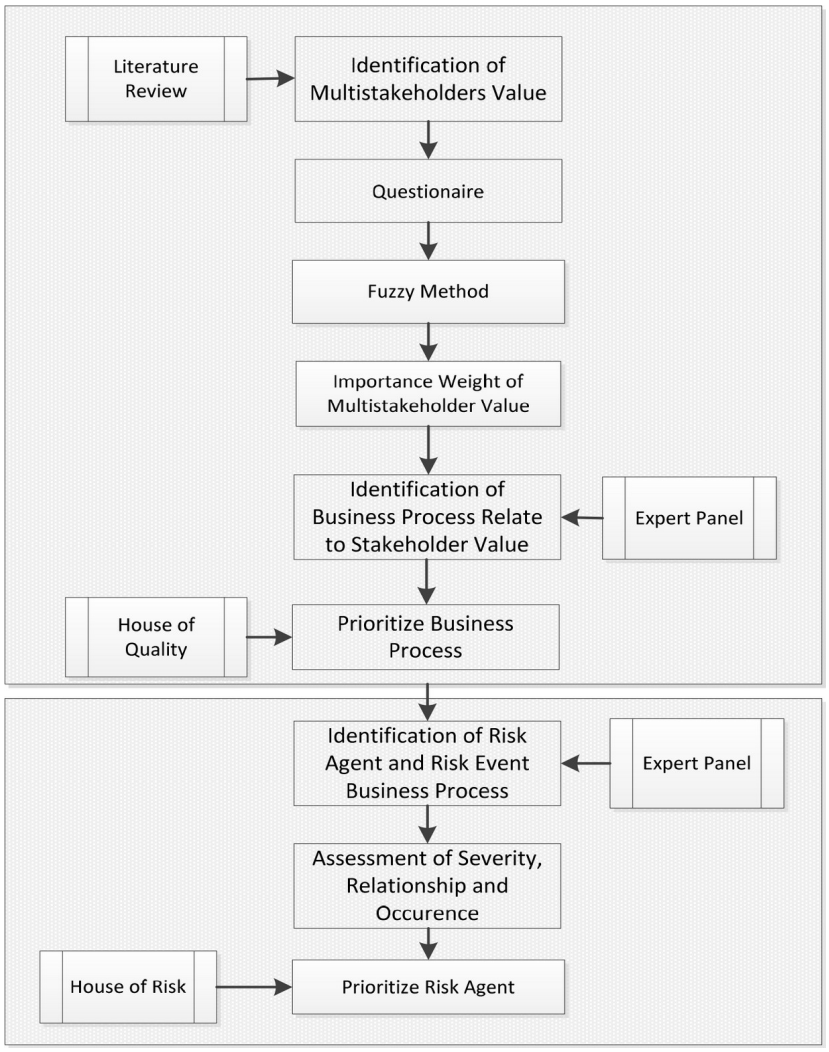

Figure 1. Framework multistakeholder Value Transformation

3.1. A Framework of Multistakeholder Value Transformation

Multistakeholder value transformation follows several stages as follows:

a) Identify multistakeholder value.

The stakeholders involved in this framework are students, lecturers, and employers. Students are the primary consumers of a process in HEIs. Meanwhile, lecturers' satisfaction affects the quality of teaching and research. (Chen et al., 2006; Tran & Do, 2020). On the other hand, employers are consumers of HEI outputs. A literature review can be conducted to identify multistakeholders value.

b) Distribute questionnaires to assess the importance level of multistakeholder value.

A survey of multistakeholder, including students, lecturers, and employers, to determine the importance and weight of value. Each respondent assess the importance level of each multistakeholder value by the Likert Scale, i.e., 1 (not important), 2 (slightly important), 3 (moderately important), 4 (important), or 5 (very important).

c) Determine the importance weight of multistakeholder value using the fuzzy method.

The Likert scales have been widely used to conduct survey research. The popularity of the Likert Scale is due to several things. For example, it is easy to compile and modify, statistical methods can analyze the results, and it has high reliability. However, the Likert Scale has some disadvantages. According to Li (2013), the burden is that respondents are forced to choose answers that may not fit the actual choice. To overcome these weaknesses, questionnaire processing with fuzzy methods. Every respondent's answer to the importance weight of value is transformed into a Triangular Fuzzy Number (TFN). It is a fuzzy number represented with three points as $\check{A}(l, m, u)$. where "l" represents the smallest likely value, "m" is the most probable value, and "u" is the largest possible value of any fuzzy event. Transformation to TFN value following Table 2. The TFN value used is adjusted to the Likert scale, and Figure 2 shows the membership number of linguistic terms.

Importance Level	Likert Scale	*Fuzzy* Number (l, m, u)
Not Important (NI)	1	(1, 1, 2)
Slightly Important (SI)	2	(1, 2, 3)
Moderately Important (MI)	3	(2, 3, 4)
Important (I)	4	(3, 4, 5)
Very Important (VI)	5	(4, 5, 5)

Table 2. Triangular Fuzzy Number

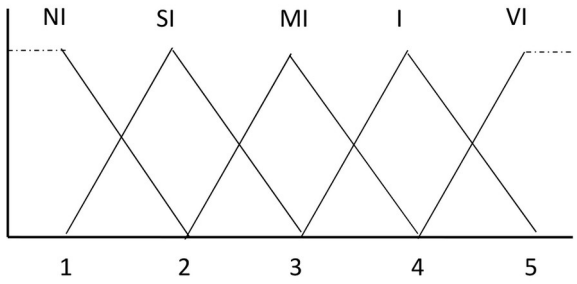

Figure 2. Membership Number of Linguistic Terms

The average of TFN is calculated using Equation (7) (Deng, 2008; Ghozal, Warsito, Bunga, Darsih & Fikri, 2021; Xi, Zhang, Li & Cheng, 2020).

$$\check{A}_{javg} = \frac{\sum_{i=1}^{n} \check{A}_j^i}{n} = \frac{(\sum_{i=1}^{n} l_j^{(i)}),(\sum_{i=1}^{n} m_j^{(i)}),(\sum_{i=1}^{n} u_j^{(i)})}{n} \quad (7)$$

$i = 1, 2, \ldots n$

$j = 1, 2, \ldots m$

where $\check{A}_j^i$ is the triangular fuzzy number of the j_{th} linguistic term under i_{th} respondent; $l_j^{(i)}$, $m_j^{(i)}$, and $u_j^{(i)}$ represent the lower, the moderate, and the upper values of the support of $\check{A}_j^i$ respectively; n denotes the total number of respondents.

To obtain the important weight of each factor by defuzzification using Equation (8), as used by (Chien & Tsai, 2000; Deng, 2008; Xi et al., 2020).

$$V_{\check{A}} = \frac{(l+2m+u)}{4} \quad (8)$$

Where $V_{\check{A}}$ is the crisp number of A~ triangular fuzzy number (l, m, u).

d) Identification of HEI's business processes related to multistakeholders value.

Business processes consist of teaching, research & community services, student affairs, and supporting activities. Identification was carried out by brainstorming and discussions with an expert panel composed of several HEI leaders.

e) Determine the priority order of business processes.

The House of Quality (HoQ) method, as in the Quality Function Deployment (QFD) model, is adopted to determine the prioritization of business processes. In this case, multistakeholder value is a need (what) that should be met, while the business process is a technical characteristic (how) that can meet the requirement. The level of relationship between each business process and multistakeholder value consists of 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship). The assessment is done using Table 3. Business processes with a large percentage of total relationships are prioritized to improve.

Multistakeholder Value (MV_i) (whats)	W_i	Business Process (BP_j) (how)			
		BP_1	BP_2	…	BP_j
MV_1	W_1	H_{11}	H_{13}	...	H_{1j}
MV_2	W_2	H_{21}	H_{23}	...	H_{2j}
…	…	…	…	...	...
MV_i	W_i	H_{i1}	H_{i3}		H_{ij}
Total Relationship		$\sum W_i H_{i1}$	$\sum W_i H_{i2}$	...	$\sum W_i H_{ij}$
Prosentase Total Relationship		$\frac{\sum W_i H_{i1}}{\sum\sum W_i H_{ij}} \times 100\ \%$	$\frac{\sum W_i H_{i2}}{\sum\sum W_i H_{ij}} \times 100\ \%$	...	$\frac{\sum W_i H_{ij}}{\sum\sum W_i H_{ij}} \times 100\ \%$

Table 3. Relationship Level Between Business Process

and Multistakeholder Value

where,

W_i = importance weight of multistakeholder value i

H_{ij} = relation level between multistakeholder value i and business process j

3.2. Framework for Determining Business Process Improvements

The purpose of this second framework is to determine business process improvements. Pujawan and Geraldin (2009) developed the House of Risk (HoR) Model that is used for risk evaluation and mitigation in Supply Chain Management (SCM). Pujawan and Geraldin (2009) modified the Failure Mode and Effect Analysis (FMEA) model and adapted the House of Quality (HoQ) model to prioritize risk agents and determine actions to reduce the occurrence of risk agents. The HoR model is widely developed and used in the field of SCM. Some other researchers have used HoR in other area, for example, product development (Dewi, Syairudin & Nikmah, 2015; Isfianadewi, Pambudi, Siswanti, Surjanti & Muafi, 2018; Kasemset, Wannagoat, Wattanutchariya & Tippayawong, 2014) and services (Hartono, Christiani & Lasiman, 2018). HoR consists of two stages, namely HoR1 and HoR2. HoR1 aims to determine the ranking of risk agents based on the Aggregate Risk Potential (ARP) value. While HoR_2 aims to determine proactive actions to reduce business process risks. This framework adopts the HoR1 method developed by (Pujawan & Geraldin, 2009). The framework consists of the following steps:

a) Determine the business process to be improved.

The first framework obtains the percentage of the total relationship between business process and multistakeholder value. As Pareto principle, business processes that contribute 80% of the total relationship value will be prioritized to improve.

b) Identify the risk event of each business process, severity (S_i) and risk agent of each risk event, and occurrence probability (O_j) of the risk agent.

Risk events are certain events that can affect the achievement of business process objectives. While the risk agent is the cause of the risk event. Severity assessment uses a scale of 1-10, where a value of 10 indicates a very severe impact. Likewise, the assessment of the probability occurrence of risk agent uses a scale of 1-10, where 1 indicates rarely occurs while 10 indicates almost certain to occur.

c) Determine the relationship between each risk event i and risk agent j (R_{ij}).

The level of relationship between each risk event i and risk agent j (R_{ij}) consists of 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship).

d) Calculate ARP_j using Equation (9).

$$ARP_j = O_j \sum_i S_i R_{ij} \tag{9}$$

O_j is the occurrence probability of risk agent j, S_i is the severity if risk event i occurs, and R_{ij} is the level of relationship between risk event i and risk agent j. ARP_j calculation can be seen in Table 4.

Risk Event (E_i)	Risk Agent (A_j)				The severity of Risk Event (S_i)
	A_1	A_2	…	A_j	
E_1	R_{11}	R_{12}	…	R_{1j}	S_1
E_2	R_{21}	R_{22}		R_{2j}	S_2
E_3	R_{31}	R_{32}	…	R_{3j}	S_3
..	…	…	…	…	…
E_i	R_{i1}	R_{i2}	…	R_{ij}	S_i
Occurrence (O_j)	O_1	O_2	…	O_j	
ARP_j	ARP_1	ARP_2	….	ARP_j	
Priority rank of risk agent j					

Table 4. HoR Business Process (Pujawan & Geraldin, 2009)

The prioritization of risk agent improvement depends on *ARPj* value. The risk agent with a large *ARP* is prioritized to improve.

4. Case Study

The framework was utilized at a private university in Surabaya, Indonesia. This private university has ten faculties, four professional programs, and one graduate school. The university has about 7000 students and about 400 lecturers. The university aims to improve its performance to be ranked in the top 30 universities in Indonesia and enter the top 500 QS World.

4.1. Multistakeholder Value Transformation

The process of transforming multistakeholder value into business process priorities follows several stages:

a) Identify multistakeholder value.

Through the literature review, 32 multistakeholder Values (MV) were obtained, which were grouped into 7 dimensions, as can be seen in Table 5.

Dimension	Multistakeholder Value (MV)	Code	Reference
Lecturer Profile	Lecturer knowledge and skills	MV1	Abbas (2020); Campos, Dos Santos & Castro (2018); Sahney (2011b)
	Lecturer teaching skills	MV2	Abbas (2020); Campos et al. (2018); Sahney (2011a)
	Lecturer attitude toward students	MV3	Abbas (2020); Koris & Nokelainen (2015); Zineldin et al. (2011)
	Lecturer's ability in research and community service	MV4	Abbas (2020); Campos et al. (2018); Sahney (2011b)
	Lecturer's practical experience	MV5	Abbas (2020); Campos et al. (2018)
	Lecturers willing to help students	MV6	Abbas (2020); Sahney (2011a)
Curriculum	The curriculum is arranged according to future needs	MV7	Abbas (2020); Campos et al. (2018); Sahney (2011a)
	Students can attend lectures across departments or universities	MV8	Campos et al. (2018)
	Students can engage in research and community service	MV9	Campos et al. (2018); Rodman et al. (2013)
	Internship program for students	MV10	Campos et al. (2018)
Infrastructure and facility	Library facilities and collections	MV11	Abbas (2020); Campos et al. (2018); Sahney (2011a); Chen et al. (2006); Sahney et al. (2008)
	Online learning facilities	MV12	Campos et al. (2018); Sahney (2011a)
	Laboratory Facilities	MV13	Campos et al. (2018); Sahney (2011a); Sahney et al. (2008)
	Classroom Facilities	MV14	Abbas (2020); Campos et al. (2018); Sahney (2011a); Sahney et al. (2008)
	Research funding support	MV15	Chen et al. (2006)
	Community service funding support	MV16	Chen et al. (2006)
Graduate Employability	Universities help graduates get jobs	MV17	Abbas (2020)
	Career training/guidance program	MV18	Abbas (2020); Rodman et al. (2013)

Dimension	Multistakeholder Value (MV)	Code	Reference
Student Skills	University has arts and sports facilities	MV19	Abbas (2020)
	Students have communication skills	MV20	Hwarng & Teo (2001)
	Students can use information technology	MV21	Hwarng & Teo (2001)
	Student analytical skills	MV22	Hwarng & Teo (2001)
Sustainability	University compliance with regulations and codes of conduct	MV23	Koris & Nokelainen (2015); Rodman et al. (2013)
	The University has external certification/accreditation	MV24	Rodman et al. (2013)
	University ranking at the national/international level	MV25	Rodman et al. (2013)
	The University conducts an internal evaluation	MV26	Rodman et al. (2013); Sandmaung & Khang (2013)
Output	Implementation of research results	MV27	Rodman et al. (2013); Sandmaung & Khang (2013)
	Graduate employment	MV28	Rodman et al. (2013); Sandmaung & Khang (2013)
	Number of national/international publications	MV29	Rodman et al. (2013); Sandmaung & Khang (2013)
	Number of patents/intellectual property	MV30	Rodman et al. (2013); Sandmaung & Khang (2013)
	Number of research	MV31	Rodman et al. (2013); Sandmaung & Khang (2013)
	Number of community service	MV32	Rodman et al. (2013); Sandmaung & Khang (2013)

Table 5. Multistakeholder value

b) Distribution of a questionnaire to find the importance level of multistakeholder value.

The questionnaire was distributed online to students, lecturers, and employers. Respondents assess the questionnaire to rate on a Likert Scale using values of 1 (very unimportant), 2 (unimportant), 3 (moderately important), 4 (important), or 5 (very important). The total number of respondents was 227 consisting of 91 (40.1%) students, 57 (25.1%) lecturers, and 79 (34.8%) employers.

c) Determine the importance and weight of each multistakeholder value.

Each respondent's assesment is transformed into a fuzzy number. Transformation into fuzzy numbers is under Table 1. Furthermore, the weight of multistakeholder value importance is calculated using Equations (7) and (8). Examples of Likert Scale values, transformation results, defuzzification, and ranking of value can be seen in Table 6.

d) Identify HEI business processes relate to multistakeholder value.

Indonesian universities must conduct education, research, and community service called Tridharma Perguruan Tinggi (Three Pillars of Higher Education) (Presiden Republik Indonesia, 2012). To identify business processes related to each multistakeholder value, brainstorming and discussions were conducted with experts consisting of 4 Deans and the Head of the Quality Assurance Office. HEI's business processes in Indonesia consist of teaching, research, community service, student affairs, and supporting activities, as summarized in Table 7.

e) Determine the priority order of business processes.

To determine the priority order of business processes, the HoQ model is used. multistakeholder value is a need (What) that must be met, while the business process is a technical characteristic (How) that can meet. The

relationship between each multistakeholder value and business process is rated 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship). An expert panel consisting of 4 Deans and the Head of the Quality Assurance Office asses the relationship. An example of the assessment can be seen in Table 8, while the complete assessment results and priority order can be seen in Table 9.

Multistakeholder Value	Respondent 1				Respondent 2				…	Respondent 227				Average			Defuzzification (Importance Level)	Rank
	Likert Scale	l	m	u	Likert Scale	l	m	u	…	Likert Scale	l	m	u	l	m	u	V_A	
MV1	5	4	5	5	5	4	5	5	…	5	4	5	5	3.80	4.80	4.98	4.60	1
MV2	5	4	5	5	5	4	5	5	…	5	4	5	5	3.78	4.78	4.99	4.59	2
MV3	5	4	5	5	5	4	5	5	…	4	3	4	5	3.62	4.62	4.91	4.44	9
MV4	5	4	5	5	5	4	5	5	…	5	4	5	5	3.51	4.51	4.92	4.36	17
MV5	5	4	5	5	5	4	5	5	…	5	4	5	5	3.56	4.56	4.93	4.41	14
MV6	4	3	4	5	5	4	5	5	…	4	3	4	5	3.60	4.59	4.93	4.43	11
MV7	4	3	4	5	5	4	5	5	…	4	3	4	5	3.66	4.66	4.94	4.48	5
MV8	4	3	4	5	4	3	4	5	…	3	2	3	4	3.18	4.17	4.76	4.07	30
MV9	4	3	4	5	5	4	5	5	…	5	4	5	5	3.38	4.38	4.88	4.25	25
MV10	4	3	4	5	4	3	4	5	…	5	4	5	5	3.61	4.61	4.96	4.45	8
MV11	4	3	4	5	5	4	5	5	…	5	4	5	5	3.45	4.44	4.87	4.30	21
MV12	4	3	4	5	5	4	5	5	…	4	3	4	5	3.41	4.41	4.87	4.28	22
MV13	4	3	4	5	5	4	5	5	…	5	4	5	5	3.63	4.63	4.94	4.46	6
MV14	5	4	5	5	5	4	5	5	…	5	4	5	5	3.46	4.46	4.90	4.32	20
MV15	3	2	3	4	4	3	4	5	…	5	4	5	5	3.56	4.56	4.91	4.39	15
MV16	3	2	3	4	5	4	5	5	…	5	4	5	5	3.50	4.50	4.90	4.35	18
MV17	3	2	3	4	4	3	4	5	…	5	4	5	5	3.41	4.40	4.83	4.26	24
MV18	3	2	3	4	5	4	5	5	…	5	4	5	5	3.52	4.52	4.91	4.37	16
MV19	4	3	4	5	5	4	5	5	…	3	2	3	4	3.12	4.12	4.73	4.02	32
MV20	4	3	4	5	5	4	5	5	…	5	4	5	5	3.62	4.62	4.94	4.45	7
MV21	4	3	4	5	5	4	5	5	…	5	4	5	5	3.71	4.71	4.96	4.53	4
MV22	4	3	4	5	5	4	5	5	…	5	4	5	5	3.74	4.74	4.98	4.55	3
MV23	5	4	5	5	5	4	5	5	…	5	4	5	5	3.60	4.60	4.93	4.43	10
MV24	5	4	5	5	5	4	5	5	…	4	3	4	5	3.52	4.51	4.87	4.35	19
MV25	5	4	5	5	4	3	4	5	…	4	3	4	5	3.33	4.33	4.82	4.20	26
MV26	5	4	5	5	5	4	5	5	…	5	4	5	5	3.58	4.58	4.93	4.42	12
MV27	4	3	4	5	5	4	5	5	…	5	4	5	5	3.41	4.40	4.89	4.27	23
MV28	4	3	4	5	5	4	5	5	…	5	4	5	5	3.57	4.57	4.94	4.41	13
MV29	5	4	5	5	4	3	4	5	…	5	4	5	5	3.23	4.23	4.80	4.12	29
MV30	4	3	4	5	4	3	4	5	…	3	2	3	4	3.15	4.15	4.78	4.06	31
MV31	5	4	5	5	4	3	4	5	…	5	4	5	5	3.23	4.22	4.82	4.12	28
MV32	5	4	5	5	4	3	4	5	…	5	4	5	5	3.28	4.28	4.83	4.17	27

Table 6. Likert scale, Fuzzy number, and Importance weight of MV

4.2. Determination of Business Process Improvement

Under the Pareto principle, 26 business processes that contribute 80 percent of the total relationship value (Table 9) will be analyzed to determine an improvement plan. Determination of improvements are s done according to the following steps:

a. Identify risk events and risk agents.

An expert panel of 4 Deans, the Research and Community Service Institute, and the Head of the Quality Assurance Office Head discuss and brainstorm to identify risk events and risk agents from 26 business processes. They also discuss determining the severity of each risk event (Si) and the probability of occurrence of the risk agent (Oj). Table 10 shows the list of risk events, risk agents, severity (Si), and occurrence (Oj).

b. Determine the relationship between each risk event and risk agent (R_{ij}).

The level of relationship between each risk event and risk agent (Rij) consists of 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship). An expert panel assesses the relationship between risk events and risk agents.

c. Calculating the ARP value of each risk agent.

Calculation of ARP use Equation (9). An example of ARP value calculation can be seen in Table 11. As an illustration, the calculation of the ARP risk agent's small number of research proposals submitted (A1) is as follows:

$$ARP_1 = 8 \times [(9 \times 7)+(3 \times 4)+(3 \times 3)+(1 \times 3)+(9 \times 8)+(3 \times 5)+(3 \times 5)+ \ldots +(3 \times 8)] = 1{,}704$$

Table 12 displays the results of the ARP_j calculation and the ranking order of each risk agent.

No.	Business Process	Code	Field
1	Further study of lecturers	BP1	Teaching
2	Professional certification for lecturers	BP2	Teaching
3	Teaching methods training	BP3	Teaching
4	"Ancangan Aplikasi and Pekerti" training	BP4	Teaching
5	Empathy training for lecturers	BP5	Teaching
6	Communication skill training for lecturers	BP6	Teaching
7	Internship program for lecturers	BP7	Teaching
8	Collaborative workshop for industry	BP8	Supporting
9	Curriculum design involves industry	BP9	Teaching
10	Tracer study	BP10	Teaching
11	Opening of cross-program courses	BP11	Teaching
12	Policy on involving students in research and community service	BP12	Research & Community Service
13	Internship program for students	BP13	Teaching
14	Addition of book collections	BP14	Teaching
15	International journal database subscriptions	BP15	Research & Community Service
16	Network and internet bandwidth improvements	BP16	Supporting
17	Improvement of facilities for online-offline class	BP17	Teaching
18	Add and upgrade laboratory equipment	BP18	Teaching
19	Improving and completing classroom facilities	BP19	Teaching
20	Budget allocation for research and community service	BP20	Research & Community Service
21	The process of applying for research and community service funds	BP21	Research & Community Service

No.	Business Process	Code	Field
22	Job fairs and on-campus recruitment	BP22	Student Affair
23	Career guidance training for students	BP23	Student Affair
24	Provision of arts and sports facilities	BP24	Student Affair
25	Public speaking training for students	BP25	Student Affair
26	The curriculum structure supports analysis and IT literacy skills	BP26	Teaching
27	Use of appropriate teaching methods	BP27	Teaching
28	Using information technology in lectures	BP28	Teaching
29	Accreditation preparation training	BP29	Supporting
30	Implementation of internal quality audit	BP30	Supporting
31	Training on the preparation of research proposals and community service	BP31	Research & Community Service
32	Journal writing training for students and lecturers	BP32	Research & Community Service
33	Training on drafting patent documents	BP33	Research & Community Service
34	Training/workshops/seminars on lecture materials/practicum for lecturers	BP34	Teaching
35	Textbook writing training	BP35	Teaching
36	Classroom management training	BP36	Teaching
37	Student exchange with other universities	BP37	Teaching
38	Formation of a research group	BP38	Research & Community Service
39	Cooperation on access to library networks between universities	BP39	Supporting
40	Maintenance and repair of laboratory equipment	BP40	Research & Community Service
41	Professional certification for students	BP41	Teaching
42	Involving students in various committees of activities that use information technology	BP42	Student Affair
43	University policy for external certification/accreditation for study programs	BP43	Supporting
44	Implementation of SPMI (Internal Quality Assurance System) in each study program and faculty	BP44	Supporting
45	Policy on the implementation of research results	BP45	Research & Community Service
46	Provision of patent/intellectual property registration budget	BP46	Research & Community Service
47	Programmed community service at university/faculty	BP47	Research & Community Service
48	Improving website quality and accessibility	BP48	Supporting

Table 7. Business process

Stakeholder Value (MV) (whats)	Wi	Business Process (BPj) (how)							Total
		BP1	BP2	BP3	…	BP20	…	BP48	
MV1	4.596	9	9		…		…		
MV2	4.586			9	…		…		
MV3	4.442			3	…		…		
MV4	4.362	9			…		…		
MV5	4.406	3	3		…		…		
MV6	4.427			3	…		…		
MV7	4.479				…		…		
MV8	4.067				…		…		
MV9	4.254				…	3	…		
MV10	4.446				…		…		
MV11	4.298				…		…		
MV12	4.275			3	…		…		
MV13	4.458				…		…		
MV14	4.318				…		…		
MV15	4.394				…	9	…		
MV16	4.351				…	9	…		
MV17	4.260				…		…		
MV18	4.371				…		…		
MV19	4.022				…		…		
MV20	4.447				…		…		
MV21	4.525				…		…		
MV22	4.547				…		…		
MV23	4.434				…		…		
MV24	4.350	9	9		…	3	…		
MV25	4.199	3			…	3	…	9	
MV26	4.416				…		…		
MV27	4.271	3			…	9	…		
MV28	4.413				…		…		
MV29	4.120	9			…	9	…		
MV30	4.059	9			…	9	…		
MV31	4.121	9			…	9	…		
MV32	4.166	3			…	9	…		
Nilai		282.2	93.73	80.77	…	304.60	…	37.89	4911.841
Prosentase Nilai		5.74%	1.91%	1.64%	…	6.20	…	0.77%	100.00%

Table 8. Relationship between Business process and Multistakeholder value

No.	Business Process	Code	Relation ship Value	Percent	Cumulative
1	Budget allocation for research and community service	BP20	304.60	6.20%	6.20%
2	The process of applying for research and community service funds	BP21	300.18	6.11%	12.31%
3	Further study of lecturers	BP1	282.17	5.74%	18.06%
4	Training on the preparation of research proposals and community service	BP31	252.85	5.15%	23.21%
5	International journal database subscriptions	P15	208.21	4.24%	27.44%
6	Journal writing training for students and lecturers	BP32	175.88	3.58%	31.03%
7	Formation of a research group	BP38	168.61	3.43%	34.46%
8	Add and upgrade laboratory equipment	BP18	160.29	3.26%	37.72%
9	The curriculum structure supports analysis and IT literacy skills	BP26	156.65	3.19%	40.91%
10	Use of appropriate teaching methods	BP27	156.58	3.19%	44.10%
11	Internship program for lecturers	BP7	143.61	2.92%	47.02%
12	Curriculum design involves industry	BP9	140.55	2.86%	49.88%
13	Career guidance training for students	BP23	135.09	2.75%	52.63%
14	Collaborative workshop for industry	BP8	134.83	2.74%	55.38%
15	Professional certification for students	BP41	118.53	2.41%	57.79%
16	Tracer study	BP10	114.63	2.33%	60.13%
17	Implementation of internal quality audit	BP30	101.13	2.06%	62.18%
18	Empathy training for lecturers	BP5	97.94	1.99%	64.18%
19	Job fairs and on-campus recruitment	BP22	95.56	1.95%	66.12%
20	Professional certification for lecturers	BP2	93.73	1.91%	68.03%
21	Communication skill training for lecturers	BP6	93.68	1.91%	69.94%
22	Network and internet bandwidth improvements	BP16	89.48	1.82%	71.76%
23	Internship program for students	BP13	88.37	1.80%	73.56%
24	Addition of book collections	BP14	82.12	1.67%	75.23%
25	Teaching methods training	BP3	80.77	1.64%	76.88%
26	Accreditation preparation training	BP29	79.14	1.61%	78.49%
27	Policy on involving students in research and community service	BP12	77.85	1.58%	80.07%
28	"Ancangan Aplikasi and Pekerti" training	BP4	67.93	1.38%	81.46%
29	Classroom management training	BP36	67.93	1.38%	82.84%
30	Training on drafting patent documents	BP33	62.21	1.27%	84.11%
31	Improvement of facilities for online-offline class	BP17	60.06	1.22%	85.33%
32	Training/workshops/seminars on lecture materials/practicum for lecturers	BP34	54.86	1.12%	86.45%
33	Opening of cross-program courses	BP11	54.11	1.10%	87.55%
34	Public speaking training for students	BP25	53.45	1.09%	88.64%
35	Provision of arts and sports facilities	BP24	45.04	0.92%	89.55%
36	Cooperation on access to library networks between universities	BP39	43.46	0.88%	90.44%
37	Improving and completing classroom facilities	BP19	43.17	0.88%	91.32%

No.	Business Process	Code	Relation ship Value	Percent	Cumulative
38	Textbook writing training	BP35	41.29	0.84%	92.16%
39	Student exchange with other universities	BP37	41.12	0.84%	92.99%
40	Using information technology in lectures	BP28	40.83	0.83%	93.82%
41	Involving students in various committees of activities that use information technology	BP42	40.83	0.83%	94.66%
42	Implementation of SPMI (Internal Quality Assurance System) in each study program and faculty	BP44	39.80	0.81%	95.47%
43	University policy for external certification/accreditation for study programs	BP43	39.03	0.79%	96.26%
44	Policy on the implementation of research results	BP45	38.45	0.78%	97.04%
45	Improving website quality and accessibility	BP48	37.89	0.77%	97.82%
46	Programmed community service at university/faculty	BP47	37.66	0.77%	98.58%
47	Provision of patent/intellectual property registration budget	BP46	36.57	0.74%	99.33%
48	Maintenance and repair of laboratory equipment	BP40	33.08	0.67%	100.00%

Table 9. Ranking of Business process

No.	Business Process	Code	Risk Event	Code	Si	Risk Agent	Code	Oj
1	Budget allocation for research and community service	BP20	Research and community service are not absorbed	E1	7	The number of research proposals submitted is small	A1	8
						Research group does not yet exist or inactive	A2	8
2	The process of applying for research and community service funds	BP21	The process of applying research and community service is too long	E2	4	The administration process is long	A3	2
						Long review process	A4	2
3	Further study of lecturers	BP1	Few who study further	E3	9	Low motivation for further study	A5	7
			Long study time	E4	7	Low research ability	A6	3
4	Training on the preparation of research proposals and community service	BP31	The number of research and community service proposals is small	E5	3	Low lecturers' interest in conducting research	A7	5
						Excess lecturer workload	A8	7
5	International journal database subscriptions	BP15	Databases are rarely used	E6	3	The database does not match the required	A9	7
						Lecturers' interest in conducting research is low	A7	5
						Lecturers do not give students the task of searching for journals	A10	5
6	Journal writing training for students and lecturers	BP32	The number of journal papers is still low	E7	8	Lack of interest of lecturers and students to write journals	A11	7
						Research group does not yet exist or inactive	A2	10

No.	Business Process	Code	Risk Event	Code	Si	Risk Agent	Code	Oj
7	Formation of a research group	BP38	Research group does not yet exist or inactive	E8	5	Low research culture	A12	8
8	Add and upgrade laboratory equipment	BP18	Laboratory equipment is lacking or *out of date*	E9	5	Laboratory budget allocation is lacking	A13	6
9	The curriculum structure supports analysis and IT literacy skills	BP26	The curriculum does not support analytical skills and IT literacy	E10	5	Understanding of curriculum development is lacking	A14	6
10	Use of appropriate teaching methods	BP27	Lecturers use teaching methods that are not under the type of course	E11	5	Lecturers do not understand the appropriate teaching methods	A15	7
11	Internship program for lecturers	BP7	Most lecturers do not internship	E12	4	Few companies accept internships	A16	4
						Lecturers' interest in participating in internships is low	A17	5
12	Curriculum design involves industry	BP9	Industry involvement in curriculum preparation is still low	E13	3	Bad relations with the industry	A18	6
13	Career guidance training for students	BP23	Few career guidance participants	E14	3	Students' lack of attention to the need for career guidance	A19	4
14	Collaborative workshop for industry	BP8	No training programs for the industry	E15	3	The training materials offered are not as needed	A20	7
15	Professional certification for students	BP41	There are not many professional certification participants for students	E16	4	Students are not yet aware of the need for professional certification	A21	5
16	Tracer study	BP10	Industry response in tracer study is low	E17	4	Improper tracer study method	A22	4
17	Implementation of internal quality audit	BP30	The work unit is late in collecting internal quality audit documents	E18	5	Supporting data of quality audit is missing/hard to find	A23	7
						Lack of commitment and coordination of internal audit implementation	A24	3
18	Empathy training for lecturers	BP5	There are no/few lecturers who participate in empathy training	E19	4	Lecturers' interest in attending empathy training is low	A25	7
19	Job fairs and on-campus recruitment	BP22	Companies and students participating in the job fair are few	E20	4	The timing of the job fair is not right	A26	4

No.	Business Process	Code	Risk Event	Code	Si	Risk Agent	Code	Oj
20	Professional certification for lecturers	BP2	Few/no skill-certified lecturers	E21	5	Low interest in following professional certification	A27	5
						There is no certification program according to the field of science	A28	3
21	Communication skill training for lecturers	BP6	There are no/few lecturers who participate in community training	E22	4	Lecturers' interest in attending communication training is low	A29	7
22	Network and internet bandwidth improvements	BP16	Internet speed is still low and not as needed	E23	6	Internet connection equipment is not as needed	A30	8
23	Internship program for students	BP13	There are no/few students who internship	E24	4	Curriculum design that is less supportive of internship	A31	4
			Internships in unsuitable industries	E25	3	The number of industries partner is less	A32	5
24	Addition of book collections	BP14	The addition of collections is not as needed	E26	5	No request for books from lecturers	A33	7
			Book collections are rarely borrowed	E27	4	Low interest in libraries	A34	6
25	Teaching methods training	BP3	Many lecturers do not master the teaching methods	E28	6	Lecturers' interest in attending teaching method training is low	A35	3
26	Accreditation preparation training	BP29	Unsatisfactory accreditation score	E29	8	Lack of understanding of accreditation preparation	A36	3
						Lack of coordination between units	A37	7

Table 10. Risk event, Risk agent, Severity, and Occurrence

Risk Event (Ei)	Risk Agent (Aj)									The severity of Risk Event (Si)
	A1	A2	A3	A4	A5	A6	A7	…	A37	
E1	9	3	3	3	9	9	3	…		7
E2	3		9							4
E3				9		1		…		9
E4					9			…		7
E5	3	3	1		3	9	1	…		3
E6	1	3	1	3	9	9		…		3
E7	9	9	3	9	9	9	1	…		8
E8	9	3	3	3	9	9	3	…		5
..	…	…	…	…	…	…		…		…
E29	3	3		9	3	3	1	…	9	8
$\sum S_i R_{ij}$	213	185	92	92	270	288	252	…	72	
Occurrence (Oj)	8	8	2	2	7	3	5	…	7	
Aggregate Risk Potential j	1,704	1,480	184	184	1,890	864	1,260	…	504	

Table 11. Calculation of ARP

No.	Risk Agent	Kode	ARP	No.	Risk Agent	Kode	ARP
1	Low motivation for further study	A5	1890	20	Few companies accept internships	A16	348
2	The number of research proposals submitted is small	A1	1704	21	Lecturers' interest in participating in internships is low	A17	315
3	Bad relations with the industry	A18	1494	22	Low interest in libraries	A34	306
4	Research group does not yet exist or inactive	A2	1480	23	Lecturers' interest in attending teaching method training is low	A35	297
5	Lack of interest of lecturers and students to write journals	A11	1337	24	Lecturers do not give students the task of searching for journals	A10	270
6	Low lecturers' interest in conducting research	A7	1260	25	Students are not yet aware of the need for professional certification	A21	255
7	Low research culture	A12	930	26	Lecturers' interest in attending empathy training is low	A25	252
8	Low research ability	A6	864	27	Lecturers' interest in attending communication training is low	A29	252
9	Supporting data of quality audit is missing/hard to find	A23	819	28	Low interest in following professional certification	A27	225
10	Lecturers do not understand	A15	693	29	Lack of understanding of	A36	216

	the appropriate teaching methods				accreditation preparation		
11	The number of industries partner is less	A32	540	30	The database does not match the required	A9	189
12	Lack of coordination between units	A37	504	31	The training materials offered are not as needed	A20	189
13	Students' lack of attention to the need for career guidance	A19	444	32	The administration process is long	A3	184
14	Internet connection equipment is not as needed	A30	432	33	Long review process	A4	184
15	Laboratory budget allocation is lacking	A13	414	34	Improper tracer study method	A22	144
16	Understanding of curriculum development is lacking	A14	414	35	The timing of the job fair is not right	A26	144
17	No request for books from lecturers	A33	399	36	Curriculum design that is less supportive of internship	A31	144
18	Excess lecturer workload	A8	371	37	There is no certification program according to the field of science	A28	135
19	Lack of commitment and coordination of internal audit implementation	A24	351				

Table 12. ARP value

5. Discussion

This research has developed a framework to identify multistakeholders value and determine the priority of HEI business process improvement. The framework consists of two parts. The first framework is used to identify multistakeholders value and transform it into a business process. While the second framework is used to determine the priority of business process improvement. Through the literature review, 32 multistakeholders values were obtained, which were grouped into seven dimensions: lecturer profile, curriculum, facility and infrastructure, graduate employability, student skills, sustainability, and outcomes. Surveys were conducted among students, lecturers, and employers to determine the level of importance of each multistakeholders value. In the survey, respondents assess the level of importance using the Likert Scale. Some academics argue that the answers in the Likert Scale are ordinal scale data, and the operations of addition, subtraction, division, and multiplication, as well as the calculation of the mean and standard deviation, cannot be performed (Vonglao, 2017). In this paper, the Likert Scale is converted into a fuzzy number. The fuzzy numbers used are Triangular Fuzzy Number (TFN) because it is easy to understand and calculate and can be applied in uncertain environments (Beheshtinia & Azad, 2019).

Based on Table 6, Lecturer knowledge and skills (MV1) and lecturer teaching skills (MV2) are the most important multistakeholder values. These results are similar to research conducted by Abbas (2020), Campos et al.(2018), and Sahney (2011b) that the most important multistakeholder values related to teacher profile (teacher knowledge, teacher expertise, teacher practical experience). Meanwhile, Students' analytical skills (MV22) are the third most important multistakeholder value. It is consistent with research conducted by Hwarng and Teo (2001), where the value of the importance level of analytical skills is in third place. Classroom facilities (MV14) are at rank 20. It contrasts with the results of research conducted by Campos et al.(2018), where classroom facilities are ranked 2. It is because the respondents in the study by Campos et al. (2018) were students. On the other hand, the multistakeholder value with the lowest level of importance is that the campus has arts and sports facilities (MV19).

In this research, 48 business processes related to the multistakeholder value have been identified. One multistakeholder value can be related to more than one business process, and vice versa; one business process can be related to more than one multistakeholder value. In the context of the Indonesian higher education system, the 48 business processes can be grouped into 4 areas, namely teaching, research and service, student affairs, and supporting activities. As seen in Table 9, the five (5) business processes that have the greatest relationship value are budget allocation for research and community service (BP20), the process of applying research and community service funds (BP21), further study of lecturers (BP1), training on the preparation of research and community service proposals (BP31) and international journal database subscriptions (BP15). Business processes have a large relationship value because they are strongly related and or related to many multistakeholder values. As an example, budget allocation for research and community service (BP20) is strongly related to research funding support (MV15), community service funding support (MV16), implementation of research results (MV27), number of national/international publications (MV29), number of patents/intellectual property (MV30), number of research (MV31), and number of community service (MV32). If the budget allocation for research and community service is prioritized, then research and community service support is large, and the number of implemented research results, publications, and patents will increase.

Previous research primarly aims to measure the level of importance and satisfaction of HEI stakeholders (Abbas, 2020; Gonzalez et al., 2011; Ku & Shang, 2020; Mcdowall, 2016; Sahney, 2011a; Sandmaung & Khang, 2013; Zhu & Sharp, 2021; Zineldin et al., 2011). In addition, it only involved one stakeholder or compared the survey results of several stakeholders. However, the study did not discuss improvements to increase stakeholder satisfaction. Unlike previous research, this research identifies a multistakeholders value, i.e., students, lecturers, and employers, so that it can fulfill not only the value of one stakeholder but fulfill the value of students, lecturers, and employers. This research also determines the business processes related to multistakeholders value and prioritizes them for improvement.

Based on the Pareto principle, a risk assessment was conducted on 26 business processes contributing around 80 percent of the total relationship value. Risk assessment is carried out by identifying risk events of 26 business processes and risk agents for each risk event. As seen in Table 10, 37 risk agents have been identified from each potential business process failure. It is necessary to prioritize the risk agent for improvement to improve the business process or anticipate failure. The priority order of improvement can be determined based on the ARP value. The results of the ARP calculation in Table 11 show that the 5 (five) risk agents that require priority for improvement are low interest in further study, a low number of research and community services proposals submitted, bad relations with industry, less active or no research groups and low interest of lecturers and students to write journals. Determining the priority of business process improvement is carried out using the House of Risk (HoR). In HoR, it is necessary to identify risk events and associated risk agents. In this case, the priority of business process improvement is based on the risk agent with the most significant potential to cause business process failure.

The management of HEI can use this framework to develop an improvement plan. In developing an improvement plan, HEI should focus on stakeholders' value. This framework is a part of Lean Six Sigma, especially to identify multistakeholders value so that it can meet or exceed multistakeholders expectations. . This is under what Davidson, Price and Pepper (2020) conveyed that lean is a strategy to meet or exceed multistakeholders expectations. Success in LSS development will increase customer value and experience (Antony, Rodgers & Cudney, 2017). To the best of our knowledge, the framework presented in this paper has not been developed in any previous studies. This framework has been used at HEI in Indonesia. However, this framework is developed in general so that it can be used in other universities.

6. Conclusion

The authors of this paper have developed a framework for transforming multistakeholder value into a business process improvement plan for an HEI. This framework has been successfully used in a private university in Indonesia. The advantage of this framework is we use three stakeholders, so in designing business processes, we consider multiple stakeholder values. The QFD approach combined with fuzzy methods can be used well in this

research, namely for transforming multistakeholder value into a business process. While the HoR approach can be used to determine the priority of improvement risk agents. The limitation of this research is that it is only at the stage of determining the priority of the risk agent; the multistakeholder used are students, lecturers, and employers. Further research opportunities include developing risk agent improvement selection models by considering the probability of success, priority, and cost. Another possibility of research is involving other stakeholders and using weighted averages to calculate the average fuzzy numbers.

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