Submission Template for ACM Papers

Prioritize Business Process Improvement Plan using House of Quality and Modified House of Risk: a Case Study of Higher Education Institution (HEI) from Indonesia

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ABSTRACT

Higher Education Institutions (HEIs) must be able to operate effectively, efficiently and focus on customers and make continuous improvements. In conducting an improvement plan, an analysis of potential risk events and risk agents are required. In addition, the improvement plan must also be oriented towards performance indicators. This article discusses business process planning at HEIs and prioritizing improvement plans. The House of Quality (HoQ) is used to calculate the relation value between business processes and key performance indicators of HEI. while the modified House of Risk (HoR) is used in prioritizing improvement plan alternative. Aggregate Risk Potential (ARP) score is a parameter to prioritize improvement. The result show that ARP score are range from 180 – 13,824. In this case, most of the risk agent improvement priorities are related to research activities: lack of research ability, lack number of research and community services proposals, research group does not establish or inactive, and low research culture.

CCS CONCEPTS

• **Social and professional topics** → Quality assurance.

KEYWORDS

Higher Education Institution (HEI), business process, risk, Modified House of Risk (HoR)

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1 INTRODUCTION

Nowadays, competition between universities is getting tougher. Universities must be able to use resources effectively and efficiently. HEI must establish better ways for teaching and learning, raise student proficiency, put the customer first, and make better use of all available resources. [1]. On the other hand, HEI must also be customer-oriented [2]. Customers of HEI consist of owners, student families, university leaders and employees, suppliers, high schools, other universities, industry, state, government, taxpayers, and professional organizations as well as family [3], [4]. HEI should focus on customer expectations. By knowing the customer expectations, HEI can prepare strategies to improve related business processes. Students are the main customers at HEI. For this reason, every HEI must know the expectation of students and translate them into operational activities. Student expectations were identified by [5] and then converted into action plans. Several other researchers have determined what students expected and suggested improvement plans [6]–[10]. Several studies used quality function development (QFD) and kano model to perform improvement analysis in [5], [6], [9], [10].

Risk management is used in many facets of contemporary life, including banking, finance, health, life, business initiatives, and project management. Risks included uncertainty regarding future government funding, an increase in post-graduate enrollment, a desire to rank highly among universities worldwide, increased competitiveness to attract top-notch international students, and international competition in research, teaching, and learning [11]. Meanwhile, the association of college and university business officers (NACUBO) defines risk as issues that affect an organization's ability to achieve goals [12]. Risk assessment is a process to evaluate and assess the magnitude of risks and the possibility of risks. The goal is to rank the risk as the basis for appropriate action. This allows universities to focus on managing significant risks [13]. Risks faced by universities are divided into strategic risks and operational risks. Risks associated with internal university governance, dangers posed by the external environment in which the university operates, and outcomes of university operations are all considered strategic

risks since they have an impact on the entire university. Operational risks are those that are connected to tasks performed by academic units and/or administrative divisions to carry out key academic activities including learning, teaching, and research as well as to manage the university's operations and resources [11]. House of risk (HoR) is a concept developed by Pujawan & Geraldin (2009). HoR made the company possible to decide which risk agents to manage and to prioritize taking preventative measures to lessen the total impact of risk events caused by those risk agents. Initially, the HoR model was developed and used in supply chain management (SCM), but some researchers used HoR in product development [15]–[17] and services [18]. This article discusses how to prioritize a business process improvement plan in using house of quality and modified house of risk (HoR).

2 METHODOLOGY

HOR consists of HOR1 and HOR2. HOR1 is used to determine which risk agents are to be given priority based on the Aggregate Risk Potential (ARP) score. HOR2 will prioritize the actions considered effective but with reasonable money and resource commitments. This article adopts HOR1 to prioritize a business process improvement plan [14]. Steps in developing HOR1 are as follows:

a. Identification of business process. In term of Indonesia HEI, the business process consist of three activities namely Teaching, Research, Community Services, and Supporting Activities.
b. Identification of risk events and risk agents of each business process.
c. The next step is calculating the ARP score to determine the priority of the risk agent that must be improved. Pujawan & Geraldin [14] used equation (1) to calculate ARP.

$$ARP_j = O_j \sum_i S_i R_{ij} \quad (1)$$

Oj is the occurrence probability of risk agent j; Si is the severity of impact if risk event i occurred, and Rij is the correlation between risk agent j and risk event i. Determining the probability (Oj) can be done if the risk agent has ever occurred. But a risk agent may never have happened. Meanwhile, the Quality of higher education (HE) has been the most critical issue. The performance-based evaluation of HEI is one of the most critical concerns. Several countries have implemented performance-based systems for measurement and funding [19]. So, every improvement should always refer to performance indicators. In the context of HEI in Indonesia, the Minister of Education and Culture of the Republic of Indonesia established key performance indicators of HEI called Indikator Kinerja Utama (IKU). These indicators are a new performance measure for universities to realize adaptive universities with more outcome-based learning. Indikator Kinerja Utama (IKU) consist of [20]:

1) Graduates Get Decent Jobs (IKU1)
2) Students Gain Off-Campus Experience (IKU2)
3) Lecturers Doing Activities Outside the Campus (IKU3)
4) Practitioners Teaching on Campus (IKU4)
5) Lecturer's Work Are Used by The Community or Get International Recognition (IKU5)
6) Study Program Collaboration with World-Class Partners (IKU6)
7) Collaborative and Participatory Classes (IKU7)
8) International Standard Study Program (IKU8)

So, in this article to calculate ARP, equation (1) is modified by replacing Oj with the total relationship value of business process with performance indicators because performance indicators are more relevant than occurrence. The equation (1) is modified to equation (2).

$$ARP_j = P_j \sum_i S_i R_{ij} \quad (2)$$

Where P_j is the total relationship value business process j with performance indicators. Si value between 1 – 10 where 10 represents extremely severe. Rij is the relationship between each risk agent and each risk event. The relationship rated as 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship). The House of Quality (HoQ) model is used to calculate the total relation value of business process j with IKU. IKU is a requirement (what) and risk event as a technical feature (how). The relationship value between each business process and IKU consists of 9 (strong), 3 (medium), 1 (weak), or 0 (no relationship). Assessment is carried out using the format in Table 1. Hij is the relationship value between IKU i and business proses j. HOR model is presented in Table 2.

The next step is the calculation of the ARP score. The complete calculation of ARP can be seen at House of Risk (HOR1) in Appendix 2. Calculation of the ARP value using equation (2). As an illustration for calculating the ARP value, risk agent A1 (low motivation to study for doctoral degree) has strong relation (9) with six risk events, each with the degree of severity 10, 5, 8, 3, 8, 5 and medium relation (3) with two risk agents with a degree of severity 6 and 5. The ARP value can be calculated as follows:

$$\text{ARP1} = 36\text{x}\left[9\left(10+5+8+3+8+5\right)+3\left(6+5\right)\right] = 13,824$$

The ARP value of other risk agents and their rankings can be seen in Appendix 2. ARP value ranges from 180 – 13,824. Six risk agents that contribute 80 % to the total ARP value will be analyzed further. The six risk agents are low motivation to study doctoral degree (A1), lack of research ability (A2), lack number of research and community services proposals (A12), the university does not have good relations with industry (A6), research group does not establish or inactive (A13), and low research culture (A19). Furthermore, it is necessary to analyze several alternative actions plan to improve each risk agent. Lecturers holding doctoral degrees are important indicators of HEI accreditation and ranking. Several efforts can be made to increase the motivation of lecturers to continue their doctoral education, for example, the provision of incentives and an attractive payroll system for lecturers holding doctoral degrees. To improve good relations with the industry, several actions can be taken, for example, holding industry gatherings, joint activities, and inviting industries to give guest lectures. Meanwhile, risk agents A2, A12, A13, and A19 are associated with an increase in the number of scientific research and publications. The number of scientific research and publications is also an indicator of HEI accreditation and ranking. Increasing the number of scientific publications can be carried out with several activities, including providing coaching for writing international journals, writing research proposals, and establishing research groups.

Table 1: HoQ Model

IKU (what)	Business Process (how)			
	BP1	BP2	. . .	BPj
IKU1	H11	H12	...	H1j
IKU2	H21	H22	...	H2j
IKU3	H31	H32	. . .	H3j
IKU4	H41	H42	...	H4j
IKU5	H51	H52	...	H5j
IKU6	H61	H62	. . .	H6j
IKU7	H71	H72	...	H7j
IKU8	H81	H82	...	H8j
Total Relationship	∑ Hi1	∑ Hi3	...	∑ Hij

Table 2: Modified House of Risk (HoR)

Risk Event (Ei)	Risk Agent (Aj)				(Si)
	A1	A2	. . .	Aj	
E1	R11	R12	. . .	R1j	S1
E2	R21	R22		R2j	S2
..	. . .	. . .	. . .	. . .	. . .
Ei	Ri1	Ri2	. . .	Rij	Si
Relationship value of business process to IKU (Pj)	P1	P2	. . .	Pj	
ARP j Rank of risk agent j	ARP1	ARP2	. . ..	ARPj	

Table 3: Relationship Matrix between Business Process and IKU

IKU (what)	Business Process (how)																			
	TE1	TE2	TE3	TE4	TE5	TE6	TE7	TE8	TE9	TE10	RC1	RC2	RC3	RC4	RC5	RC6	SA1	SA2	SA3	SP1
IKU1		3	9	3	3	9		9	3						1		9	9	9	
IKU2					1						3				3					
IKU3	9				9		9			3			3							
IKU4					1	1	3													
IKU5	9	3			1		3			1	9	9	9	3	3	9				
IKU6	9	3			3	1	3			1	1	1	1	3	3					
IKU7			3	9	1				1						3	1				
IKU8	9	3		1	1						3		1	3	3	1				9
Total Relation	36	12	12	13	20	11	18	9	4	5	16	10	14	9	16	11	9	9	9	9

3 CONCLUSSION

In this article, a modified HOR1 model has been implemented to identify risk agents and risk events business process pada HEI. Modification HOR1 is done by replacing the occurrence probability of risk agent (Oj) with total relationship value business process j with performance indicators (Pj). In the context of HEI, the use of Pj in calculating ARP is more appropriate because every business process planning always leads to the achievement of performance indicators. HOR1 can be implemented at HEIs to identify priorities for risk agent improvement in teaching, research & community services, student affairs, and supporting activities. In this case, most of the risk agent improvement priorities are related to research activities: lack of research ability, lack number of research and community services proposals, research group does not establish or inactive, and low research culture. The next research opportunity is to use the fuzzy method in assessing the relationship between the business process and IKU and the relationship between risk agents and risk events.

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APPENDIX 1. BUSINESS PROCESS, RISK EVENT AND RISK AGENT

Activity	Business Process	Code	Risk Event	Code	Risk Agent	Code
Teaching	Lecturer study doctoral degree	TE1	Few lecturers study doctoral degree	E1	Low motivation to study doctoral degree	A1
			Long time to finished doctoral degree	E2	Lack of research ability	A2
	Add and upgrade laboratory tools and equipment	TE2	Lack of laboratory tools and equipment or out of date	E3	Less laboratory budget	A3
	Curriculum structure supports IT analysis and literacy skills	TE3	Curriculum does not support IT analysis and literacy skills	E4	Inability of curriculum design	A4
	Use of appropriate teaching methods to subject	TE4	Lecturers use teaching methods that are not in accordance with subject	E5	Lecturers do not understand the appropriate teaching methods	A5
	Internship program for lecturers	TE5	Most lecturers are not internship	E6	University does not have good relations with industry	A6
	Industry Involvement in curriculum design	TE6	Few industries involvement in curriculum design	E7	University does not have good relations with industry	A6
	Training program for industry	TE7	There is no training program for the industry.	E8	The training materials offered are not as needed	A7
	Graduate's skills requirement survey	TE8	Low response rate from respondents	E9	Improper survey methods	A8
	Empathy training for lecturers	TE9	No/few lecturers participated in empathy training	E10	Lack of Interest of lecturers to join in empathy training	A9
	Professional Certification for lecturers	TE10	Few /no lecturers have expertise certification	E11	Lack of interest in certification	A10
					No related certification program	A11
Research & Community Services	Allocation of research and community services budgets	RC1	Low budget of research and community services	E12	Lack number of research and community services proposal	A12
					Research group does not establish or inactive	A13
	Mechanism of applying research and community services funds	RC2	The process of submitting research and community services budget is too long	E13	The mechanism of proposing fund is too complicated and take time	A14
	Training in writing research and community services proposals	RC3	Lack of participant in training of writing research and community services proposals	E14	Lack of interest in research and community services	A12
					Excess lecturer workload	A15
	International journal database subscription	RC4	Data base is rarely used	E15	Database is not as needed	A16
					Lack of interest in research and community services	A12
					Lecturers do not give assignments to students to find journals	A17
	Journal writing training for students and lecturers	RC5	The number of journals is still low.	E16	The interest of lecturers and students to write journals is still low	A18
					Research group does not establish or inactive	A13
	Development of research group	RC6	No research group or inactive	E17	Low research culture	A19
Student Affair	Career training for students	SA1	Little participants in career guidance	E18	Lack of student's attention to career guidance needs	A20
	Job fair and recruitment on campus	SA2	Less companies and students participating in the job fair	E19	The timing of the job fair is not right	A21
	Professional certification program for students	SA3	Lack of participant in professional certification	E20	Students do not yet aware to the importance of professional certification	A22
Supporting	Implementation of internal quality audit	SP1	Working unit late to collects internal audit documents	E21	Difficult to find supporting data	A23
					Lack of commitment and coordination in internal audit implementation	A24

APPENDIX 2. HOUSE OF RISK (HOR1)

Risk Event	Risk Agent (Aj)																								(Si)
(Ei)	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	
E1	9	9																							10
E2	9	9																							5
E3			9																						5
E4				9																					5
E5					9																				8
E6						9																			4
E7						9																			7
E8			3			9	9																		3
E9						9		9																	5
E10									9																5
E11	3									9	9														6
E12	9	9										9	9												8
E13												9	3	9											5
E14	3											9	3	3	3				9						5
E15	9	3										3	3	3	3	9	9		3						3
E16	9	9										9	3	3	3	1		9	9						8
E17	9	9										3		1	1	1		3	9						5
E18																				9					3
E19						3														3	9				3
E20																						9			4
E21																							9	9	5
$\sum S_i R_{ij}$	384	333	54	45	72	180	27	45	45	54	54	258	135	98	53	40	27	87	171	36	27	36	45	45	
Relationship value of business process to IKU (Pj)	36	36	12	12	13	20	18	9	4	5	5	16	16	10	14	9	9	16	11	9	9	9	9	9	
Aggregate Risk Potential (ARPj)	13824	11988	648	540	936	3600	486	405	180	270	270	4128	2160	980	742	360	243	1392	1881	324	243	324	405	405	
Priority rank of risk agent j	1	2	11	12	9	4	13	14	24	20	20	3	5	8	10	17	22	7	6	18	22	18	14	14	