

ORIGINAL ARTICLE**JOB DESCRIPTION DESIGN BASED ON BUSINESS PROCESS MAPPING AND WORKLOAD ANALYSIS USING M-FTE AND DRAWS**Adithya SUDIARNO¹, Ilham AKBAR², Ratna Sari DEWI³, Anny MARYANI⁴, Dyah Santhi DEWI⁵¹Industrial System and Engineering Dept., Faculty of Industrial Technology and System Engineering, Sepuluh Nopember Institut of Technology, Sukolilo, Surabaya, Indonesia²Industrial System and Engineering Dept., Faculty of Industrial Technology and System Engineering, Sepuluh Nopember Institut of Technology, Sukolilo, Surabaya, Indonesia³Industrial System and Engineering Dept., Faculty of Industrial Technology and System Engineering, Sepuluh Nopember Institut of Technology, Sukolilo, Surabaya, Indonesia⁴Industrial System and Engineering Dept., Faculty of Industrial Technology and System Engineering, Sepuluh Nopember Institut of Technology, Sukolilo, Surabaya, Indonesia⁵Industrial System and Engineering Dept., Faculty of Industrial Technology and System Engineering, Sepuluh Nopember Institut of Technology, Sukolilo, Surabaya, Indonesia**ABSTRACT**

An Indonesian State-Owned Company which works on IT-based projects is experiencing an unbalanced workload among its project teams. This problem causes profit loss due to the overruns of project schedules. It has been determined that this problem originates from the job descriptions for each position that has not been well structured. Therefore, business process mapping is needed to reformulate the job description by employing a RASCI (Responsible-Accountable-Support-Consulted-Informed) Matrix. The revised job description is then used as the basis of Modified Full-Time Equivalent (M-FTE) calculation and subjective workload assessment. M-FTE calculation shows the ideal number of personnel needed for a specific position. The subjective workload assessment is also conducted in this study to complement M-FTE calculation. It is conducted by using the Defense Research Agency Workload Scale (DRAWS). Both M-FTE and DRAWS indicate the overload condition of each position. Finally, this study recommends adding one personnel for each position evaluated.

Keywords: RASCI Matrix, Workload Analysis, M-FTE, and DRAWS**INTRODUCTION**

X Ltd. is an Indonesian State-Owned Company focuses on IT solution projects. This company has more than 1 000 clients from various types of industries. The solutions offered by the company cover system integration software, data center, and managed services. Currently, the company is facing an unbalanced workload within its delivery team. This condition is due to the job description of each role/ position in the project team which is not well defined. As a consequence, there are a lot of inefficiencies in the delivery of the customer's project outputs. There is also a shortage in the number of personnel in the project such that every personnel are experiencing work overload. Accumulative impacts on the company performance are profit loss, project schedule overrun, and lower achievement of Service Level Agreement (SLA) promised to its customers. Therefore, workload assessment is necessary to be conducted to understand and overcome these problems. There are 3 general stages of workload analysis as depicted in figure 1, namely business process identification, job analysis, and workload measurement (Hutagalung and Gustomo, 2013). In the business process identification stage, business process mapping and organizational structure are identified. Then, the job descriptions and job specifications are defined in the job analysis phase. Lastly, workload measurement can be

conducted. There are 3 types of workload measurements, i.e., physiological, subjective, and performance (Meshkati, Hancock, Rahimi, and Dawes, 1995).

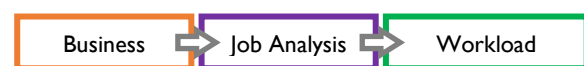


Figure 1. General Stage of Workload Measurement
Source: Hutagalung and Gustomo (2013)

The objectives of this study are (1) designing a job description for each position based on the business process mapping using RASCI Matrix; (2) calculating the ideal number of workers of each position by employing Modified Full Time Equivalent (M-FTE) method; and (3) Analyzing employee's subjective mental workload based on the Defense Research Agency Workload Scale (DRAWS) approach. In this article, the project team assessed is focused on the 4 main positions, i.e., Business Analyst (BA), Project Manager (PM), Technical Consultant (TC), and Quality Assurance (QA).

METHODOLOGY**RASCI Matrix**

RASCI (Responsible-Accountable-Support-Consulted-Informed) matrix is an approach for identifying business process and roles of individuals in a team. In the matrix, each person is classified whether he / she is Responsible,

Accountable, Support, Consulted or Informed for every task. Responsible (R) means the person who must perform the work or must complete the task. Accountable (A) means the person who gives the approval for the work performed by the person who responsible for the task. Support (S) means the person who helps the person with responsibility (R) or the person who may assist in completing the task. Consulted (C) means the person whose opinion is sought while the person with responsibility (R) is carrying out the task. Informed (I) means the person who needs to be informed regarding the progress of the task (Cabanillas, Resinas, and Ruiz-Cortés, 2011).

M-FTE

According to Dewi (2013) and Girasek et. al. (2016), Full-Time Equivalent (FTE) is one of the time-based workload analysis methods by calculating the total working time of all activities that are then converted into the FTE index. While the Modified FTE (M-FTE) method is the FTE which considers time drivers, i.e., factors which may cause variations on working time of a specific activity.

DRAWS

Defense Research Agency Workload Scale (DRAWS) method is a technique to measure mental workload subjectively in order to know the workload based on 4 dimensions namely, Input Demand (ID), Central Demand (CD), Output Demand (OD), and Time Pressure (TP). The principal reason for measuring mental workload is to quantify the mental cost of performing tasks in order to predict operator and system performances (Cain, 2007).

RESULT

Job Description Each Position

In order to design job description for each position using RASCI Matrix and acquiring the M-FTE index, this study conducted Focus Group Discussion (FGD) involving 4 job holders as the experts, which are Business Analyst (BA), Project Manager (PM), Technical Consultant (TC), and Quality Assurance (QA). This FGD also attended by staff of the Human Capital Division. The experts are selected by the Human Capital Division of the company with criteria having experiences in handling various types of projects, having more than 5 years of service, and understand the ideal role to carry out business process activities. Table 1 shows the detail of job descriptions for BA, PM, TC, and QA defined by FGD. It also shows the RASCI code for each job description.

Table 1. Job Description and RASCI Code of BA, PM, TC, and QA Defined by FGD

Position: Business Analyst (BA)		
No.	Job Description	RASCI Code
M1	Gather and analyze business requirements expected by the client.	S

M2	Identify, analyze and document Functional Specification Design (FSD) in accordance with business requirements.	R
M3	Conduct FSD conformity assessments made with product libraries.	R
M4	Estimate COGS (Cost of Good-Sold), HR resource requirements, mapping and mitigating various potential risks that will be faced during the project.	R
M5	Categorize the portfolio project into the Green Zone, Yellow Zone, or Red Zone.	R
M6	Become a single contact point to justify the continuation of Change Request (CR).	C
S1	Update information to related parties.	R

Position: Project Manager (PM)		
No.	Job Description	RASCI Code
M1	Compile and design risk mitigation for project activities, as well as allocate resources (budget, HR, etc.) referring to the input from BA.	R
M2	Lead and direct project teams in carrying out project deliverables.	A
M3	Communicate with clients related to planned activities, implementation of project activities, and results of project activities.	R
M4	Conduct mediation with related parties if there are indications for project delays.	R
M5	Resolve problems in projects related to budget, performance, and schedule.	R
M6	Review the project report for the Project Management Officer (PMO).	R
M7	Ensure prerequisite of the fulfillment of each project's checklist handover.	R
M8	Develop a success story project as a form of learning lessons.	R
S1	Manage critical information delivered by team projects to be used in decision making.	I
S2	Provide advice on the request of the team project according to their individual needs.	C

Position: Technical Consultant (TC)		
No.	Job Description	RASCI Code
M1	Translate Software Requirements Specification (SRS) into high functional code.	R
M2	Perform system customization in accordance with SRS and/ or Entity Relationship Diagram (ERD)	R
M3	Build an easy-to-use user interface.	R
M4	Test code and debugging in order to ensure compliance with SRS and avoid the errors.	R
M5	Build code libraries and document all apps developed.	R
M6	Discover and apply the development using the most updated programming languages.	R
S1	Make documentation of the progress periodically.	R
S2	Update information to related parties.	R

Position: Quality Assurance (QA)		
No.	Job Description	RASCI Code
M1	Review Functional Specification Design (FSD) to determine the quality parameters used in the software assessment.	R
M2	Conduct IST (Internal Software Testing), both partially and as a whole of software.	R
M3	Evaluate the User Interface (UI) and User eXperience (UX) for the entire software.	R
M4	Make logs (notes) for testing phase and reporting errors to TC.	R
M5	Review the results of improvements made by TC according to previous IST recommendations.	R
S1	Periodically document the progress.	R
S2	Update information to related parties.	R

Information: R= Responsible; A= Accountable; S= Support; C= Consulted; I= Informed; M1-M8=1st Main Job Description-8th Main Job Description; S1-S2=1st Support Job Description -2nd Support Job Description. Source: Authors

M-FTE Calculation

The M-FTE index is also obtained by the FGD as well as the job description design process. The formula used to calculate M-FTE index shown in equation (1).

$$M - FTE = \frac{\text{Total Working Hours per Year} + \text{Allowance}}{\text{Effective Working Hours per Year}} \quad (1)$$

M-FTE index is divided into 3 categories based on Dewi (2013) and Indonesian Minister of Administrative Reform Decree No: 75/7/2004 (2004) as summarized in Table 2.

Table 2. M-FTE Three Categories

Category	M-FTE Index
Underload	≤1,00
Optimal load	1 < score ≤ 1,28
Overload	>1,28

Source: Authors

M-FTE calculation in this study covers two types of activities, namely fixed and variable activity. Fixed activity means the activity that is always done on each project and predicted spend the same amount of time in every project. Meanwhile, variable activity means the activity that is not always performed on each project (conditional). On the other hand, variable activities will spend a different amount of time in every project due to its complexity varies among projects. Although it has a different amount of time spent, the FGD defined three possible times and its predicted time, namely optimistic time, pessimistic time, and realistic time. Table 3 shows the M-FTE calculation for BA. The mentioned amount of time for variable activities in Table 3 refers to the realistic amount of time.

Table 3. M-FTE Calculation and Result Example for BA

Position: Business Analyst (BA)								
No.	Type of Activity	Work Volume Average			Applied-Working Time Average			Total Time (min)
		Freq.	Freq. Unit	Unit of Period	Time Spent	Unit of Time	Amount of Time (min)	
M1	Fixed	1	Time s	Week	8	Hour	480	15 360
M2	Fixed	1	Time s	Week	8	Hour	480	15 360
M3	Fixed	2	Time s	Week	3	Hour	180	11 520
M4	Fixed	2	Time s	Day	2	Hour	120	42 240
M5	Fixed	1	Time s	Day	1	Hour	60	10 560
M6	Variable	1	Time s	Day	20*	Minute	20	31 680
S1	Variable	1	Time s	Day	15*	Minute	15	5 280
Total Amount of Time Spent by BA to do all item of job desc.								132 000
Effective Working Hour based on Project Duration (min)								84 480
M-FTE index								1,562 5
NOTE *: predicted time spent using realistic time amount								

Source: Authors

By using the same M-FTE calculation method shown in Table 3, then M-FTE index also can be obtained for PM, TC, and QA. Summary of all results shown in the following Table 4.

Table 4. M-FTE Result Summary

Positions	M-FTE Score	Category
Business Analyst (BA)	1,562	Overload
Project Manager (PM)	1,960	Overload
Technical Consultant (TC)	1,733	Overload
Quality Assurance (QA)	1,294	Overload

Source: Authors

DRAWS Calculation

In order to acquire the subjective mental workload score, the DRAWS questionnaires was distributed to 8 employees who represent each position evaluated. These employees were also selected by the Human Capital Division. The Number of DRAWS respondents is doubled than FGD session in order to minimize respondent subjectivity. DRAWS calculation contains 3 steps namely DRAWS questionnaire formulation, dimensions rating calculation, and workload index calculation. Workload index scores are divided into three categories as summarized in Table 5 (Syafei, Primanintyo, and Syaefuddin, 2017).

Table 5. DRAWS Three Categories

Category	DRAWS Index
Underload	≤40%
Optimal load	40% < score ≤ 60%
Overload	>60%

Source: Authors

The first step in DRAWS approach is to build a questionnaire based on DRAWS dimensions. Table 6 shows the question asked toward each position.

Table 6. DRAWS Questionnaire

Dimension	No.	Question
Input Demand (ID)	1	In your opinion, how much workload do you feel when you get a task?
	2	In your opinion, how much workload do you feel when you know the project goals?
	3	In your opinion, how much workload do you feel when you find out there are indications of project delays?
Central Demand (CD)	1	In your opinion, how much workload do you feel when interpreting business requirements becomes a task?
	2	In your opinion, how much workload do you feel when analyzing the errors in the task?
	3	In your opinion, how much workload do you feel when identifying the project timeline in the task?
Output Demand (OD)	1	In your opinion, how much workload do you feel when coordinating with the team?
	2	In your opinion, how much workload do you feel when working on the task?
	3	In your opinion, how much physical burden do you feel when working on a task?
Time Pressure (TP)	1	In your opinion, how much workload do you feel when you know the task execution period in the project timeline?
	2	In your opinion, to what extent do you feel the workload when the process of tasking is approaching the deadline for work?
	3	In your opinion, how much workload do you feel when there are significant changes in the task when it approaches the deadline for the time period?

Source: Authors

After developing the questionnaire, the next step is to distribute it toward eight employees assigned by the Human Capital Division. The data filled up in the questionnaire consists of 2 types, i.e. question rating and dimensions weight. The DRAWS question rating calculation shown in Table 7.

Table 7. DRAWS Question Rating Calculation

Respondent	Input Demand Question				Central Demand Question			
	ID1	ID2	ID3	Avg	CD 1	CD 2	CD 3	Avg
BA1	70	90	95	85,0	60	70	70	66,7
BA2	80	80	10	56,7	80	80	80	80,0
PM1	70	90	95	85,0	90	90	75	85,0
PM2	40	60	80	60,0	40	50	50	46,7
TC1	75	85	95	85,0	85	90	80	85,0
TC2	80	80	90	83,3	80	85	80	81,7
QA1	50	80	85	71,7	60	85	70	71,7
QA2	50	80	30	53,3	50	90	70	70,0

Respondent	Output Demand Question				Time Pressure Question			
	OD 1	OD 2	OD 3	Avg	TP 1	TP 2	TP 3	Avg
BA1	50	70	75	65,0	80	90	95	88,3
BA2	80	80	70	76,7	70	90	90	83,3
PM1	80	80	70	76,7	80	90	90	86,7
PM2	40	40	30	36,7	50	70	80	66,7
TC1	60	60	75	65,0	70	90	100	86,7
TC2	80	85	80	81,7	90	100	100	96,7
QA1	70	80	80	76,7	80	85	85	83,3
QA2	85	90	60	78,3	70	90	100	86,7

Source: Authors

Subsequently, the dimensions weight collected were processed on Expert Choice Software that the result shown in Figure 2.

**Priorities with respect to:
DRAWS Weighting between Dimensions**

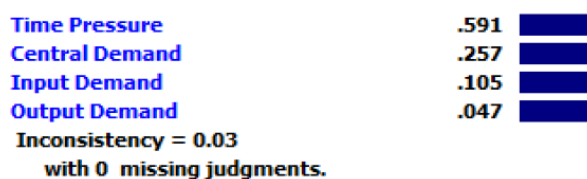


Figure 2. Dimensions Weighting Result of DRAWS
Source: Authors

Thus, the next step of DRAWS calculation is multiplying the question and dimension weight for each respondent. Table 8 shows the DRAWS workload index summary result.

Table 8. DRAWS Workload Index Summary Result

Resp	Weight				Score	Avg	DRAWS Category
	ID	CD	OD	TP			
BA1	8,93	17,13	3,06	52,21	81,32	80,34	Overload
BA2	5,95	20,56	3,60	49,25	79,36		
PM1	8,93	21,85	3,60	51,22	85,59	72,51	Overload
PM2	6,30	11,99	1,72	39,40	59,42		
TC1	8,93	21,85	3,06	51,22	85,05	87,88	Overload
TC2	8,75	20,99	3,84	57,13	90,71		
QA1	7,53	18,42	3,60	49,25	78,80	78,64	Overload
QA2	5,60	17,99	3,68	51,22	78,49		

Source: Authors

Based on the result in Table 8, it can be seen that all positions are overloaded as its DRAWS workload index score exceeds 60%. The overall workload is relatively high due to time pressure perceived by the employees. Table 8 shows that TP contributes to the most significant value of weight (0,591) compared to other dimensions. ID, CD, and OD only provide weights of 10,5%; 25,7%; and 4,7% respectively. The average of TP's question rating also contributes to the high DRAWS score. Compared to other question ratings, TP has the highest average that is 84,8.

M-FTE and DRAWS Result Comparison

The previous discussion focusses on an individual analysis of M-FTE result and DRAWS result. Further analysis will be conducted on M-FTE and DRAWS result comparison. Table 9 shows the comparison between M-FTE and DRAWS result.

Table 9. Comparison Between M-FTE and DRAWS Result

Positions	M-FTE score	Category	DRAWS score	Category
Business Analyst (BA)	1,562	Overload	80,34	Overload
Project Manager (PM)	1,960	Overload	72,51	Overload
Technical Consultant (TC)	1,733	Overload	87,88	Overload
Quality Assurance (QA)	1,294	Overload	78,64	Overload

Source: Authors

Based on the result of Table 9, it can be seen that the comparison between M-FTE and DRAWS result has the same characteristics that is overload in each position. This comparison shows that working on each position has a high workload in both the time-based measurement and subjective perspective.

Thus, for each role, additional personnel are needed to reduce workload. In each BA, PM, TC, and QA, it is recommended to add 1 personnel. This recommendation is based on M-FTE threshold, that is more than 1,28 (1.28) indicating the need more personnel. Due to all M-FTE score still under 2,56 (2.56) so each position only needs to be added 1 personnel.

CONCLUSIONS

This study has shown that the RASCI Matrix approach is used to define standard job descriptions for BA, PM, TC, and QA positions through FGD involving the experts. The results of the RASCI Matrix used as input for the M-FTE calculation in order to determine the workload index. In this study, M-FTE result has shown that all positions are overloaded, based on the M-FTE score being >1,28. The M-FTE calculation refers to the time-based workload analysis. This study also completes the time-based workload analysis with the subjective workload analysis. For this purpose, the DRAWS calculation is used. The workload assessment results based on DRAWS for all

positions are categorized as overloaded, as indicated by the DRAWS score of >60%. Thus, from both calculations, it is recommended to add personnel to each position. In BA, PM, TC, and QA the addition of one personnel each is recommended.

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