# Public procurement in Malaysian local authorities: Antecedents of procedural rationality in decision making

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## ABSTRACT

*The Malaysian public sector is oversaturated with comprehensive procurement procedures. These measures aim to deter unwarranted behaviours from public officers. Nevertheless, there have been recurring irregularities over the past decade in Malaysian local authorities, including work delays, non-compliance with regulations, wasteful purchasing, substandard workmanship etc. This study aimed to investigate factors undermining rationality in public procurement decision making from the cognitive perspective. The cognitive and behavioural science literature was reviewed systematically, focusing on procedural rationality to develop a predictive model of procurement irregularities. This research adopted a quantitative approach. A total of 289 datasets were collected from the procurement officers of Malaysian local authorities and analysed using the Partial Least Square Structural Equation Modelling technique. The empirical findings showed that work experience, prior knowledge, and accountability correlate directly with procedural rationality in procurement decision-making, which would impact the procurement outcome. The research offered insights into the decision-making behaviour of procurement officers from the cognitive psychology perspective. From the managerial standpoint, public procurement procedures should incorporate the elements of accountability, experience, and prior knowledge as part of the quality assurance and control measures.*

**KEYWORDS**: Accountability, Decision making, Procedural rationality, Procurement irregularities, Public procurement.

## INTRODUCTION

The public procurement system is generally lengthy (Fenster, 2012) with comprehensive rules (Gourdon & Bastien, 2019), meant not only to hold contractors accountable for their performance (Kuchina-Musina *et al*., 2020) but to ensure the professionalism of public officers in decision making (OECD, 2016). Nevertheless, the system has failed to ensure rational performance (Jones, 1999; Jones, 2003) as well as accountability for performance (Aucoin & Heintzman, 2000). The recurring examples of non-compliance, thriftlessness, delays, and poor workmanship in Malaysian government procurement (National Audit Department Malaysia, 2018; National Audit Department Malaysia, 2019) have caused public outrage over the irrationality of these procurement decision makers (Fernandez & Goh, 2006).

The personnel, being the decision makers, are one of the important indicators in evaluating the performance of the national procurement system (OECD, 2006; U.S. Government

Accountability Office, 2006). Many researchers have suggested that public procurement irregularities are largely caused by human factors rather than the system (Ambe & Badenhorst-Weiss, 2012; Dekel & Schurr, 2014), such as carelessness in following standard procedures (Hui *et al.*, 2011; Othman *et al.*, 2010) and inadequate planning, monitoring and evaluation (Jones, 2013). These are largely incidents of non-compliant behaviours in public procurement decision making, an area where research is scarce. Previous scholarly works in the domains of cognitive and behavioural science were reviewed to form an understanding of this issue.

## LITERATURE REVIEW

### Decision Making

Decision making is primarily about contemplating and reasoning between choices; these choices are made either diligently or intuitively. Chapman and Niedermayer (2001) suggested that purposeful and meticulous behaviour form the basic conception of decision making. Keynes (1993 [1936]) believed that decision makers habitually extrapolate the current understanding of situations into the future. Though their forecasts are not always accurate, they are amended only to the extent that they are foreseeable. On the other hand, Veblen (2006 [1914]) suggested that individuals rely on habits and their intuition in decision-making. This intuition is associated largely with the pattern recognition of problems (Simon, 1976).

Prietula and Simon (1989) suggested that a long experience in pattern recognition would allow decision makers to fuse both analytic thinking and intuitive thinking in a seamless decision making strategy. Cordes (2005) concurred that "instincts and habits operate alongside conscious reasoning and also penetrate conscious reasoning processes themselves". This notion is corroborated by Gigerenzer and Gaissmaier (2011) under the concept of ecological rationality. Either intuitive or analytical strategies can be regarded as ecologically rational if the decision- making approach matches the problem structure of the environment.

### Bounded Rationality

Gigerenzer *et al.* (1999) propounded the vision of rationality which generally underpins various thoughts in decision making. The model (Figure 1) first presumes that the individual possesses imaginal competency for reasoning (demons) and demonstrates unbounded rationality or optimisation capability. He has no time, knowledge, or resource limitation for making a decision. This unbounded rationality is non-existent in the real world but has been theorized as the maximisation of expected utility (Gigerenzer *et al.*, 1999), whereas optimisation under constraints recognises a search limit. The individual is capable of computing the cost-benefit advantage of searching for an additional piece of information. The search ceases when the costs exceed the benefits (Sargent, 1993).

The second part of the model expressly recognises individuals as having limited reasoning power – the notion of bounded rationality proclaimed by Herbert Simon (1972). He stated that individuals "must use approximate methods to handle many tasks" due to the limitation of the mind. These are good enough solutions for real world problems – the satisficing approach. In addition, Gigerenzer *et al.* (1999) suggested that the most genuine form of bounded rationality appears in fast and frugal heuristics – a limited information search is used (satisficing) while exploiting the environment structure to make adaptive decisions.

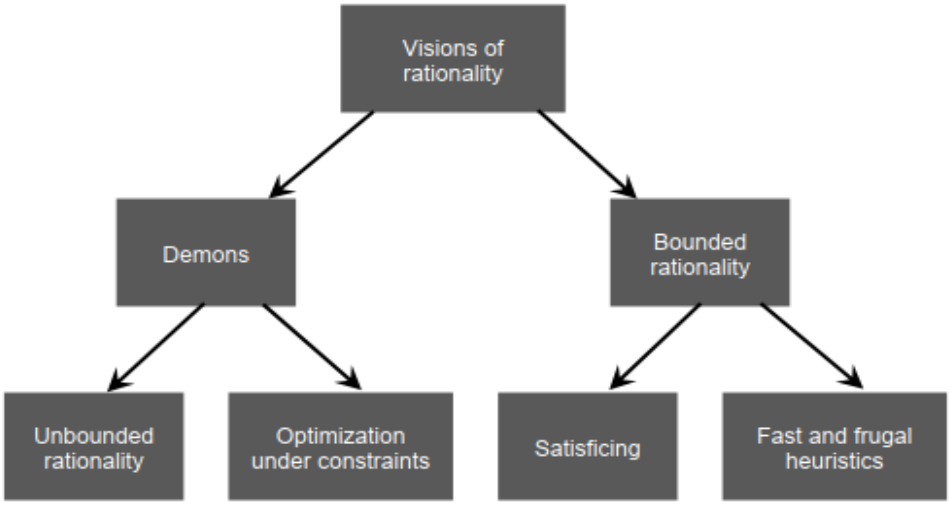


**Figure 1: Vision of rationality. Source: Gigerenzer *et al.* (1999)**

## Procedural Rationality

Due to cognitive limitations in the human mind, Simon (1976) pioneered the concept of procedural rationality. This accepts the fact that individuals are always unable to determine if they have made a rational decision. Therefore, a sensible person will design appropriate and adaptive procedures for decision making (Simon, 1976). Such procedures should be able to exploit individuals' strengths as problem solvers for producing the most optimal solution – procedural rationality. These strengths are not the capabilities to produce, process, and analyse enormous data. Instead, they use experience and wisdom to identify a few good enough alternatives for further investigation and analysis (Simon, 1976). Dean and Sharfman (1993) have defined procedural rationality as "the extent to which the decision process involves the collection of information relevant to the decision and the reliance upon analysis of this information in making the choice" (p. 589). Procedural rationality largely aims to produce the best possible solution under given circumstances. A higher level procedural rationality requires the attainment of more judgement-related information and exhaustive assessment, whereas a lower level procedural rationality implies less information collection and less exhaustive assessment (Alessandri Todd, 2008, p. 200).

## Public Procurement

Problems in the supply chain can arise from various sources; some of these sources are labour disputes, supplier financial issues, natural disasters, and acts of war. Site layout planning is unique for each construction project as it depends on many variables. The challenge in optimising the site layout plan is to account for the various constraints such as the location of the project, accompanying facilities, and shape of the construction site. Site planners normally approach site facilities as rectangular blocks for easier positioning on a construction site. Such an approach creates an unequal area for construction within the site layout (Zolfagharian & Irizarry, 2014).

## Supply Chain Disruptions

The public procurement process in Malaysia involves the assessment, selection and award of tenders. The process requires a high level of procedural rationality in decision making, ensuring the constant and best value of goods and services for the government (Ministry of Finance

Malaysia MOF, 2010). A comprehensive procedural regulation governs malaysian public procurement to ensure procedural rationality. This control mechanism includes Treasury Circular Letters, the Federal Contract Circular, Treasury Instruction, Financial Procedure Act 1957, and the Government Contract Act 1949.

The obligations and duties of public officials are stipulated ex-ante via these procedural regulations. Presumably, this would exert adequate control over individual and group decision-making behaviours in procurement committees (Adham & Siwar, 2012) and reduce the possibilities of making defective decisions. In other words, if public officers strictly adhere to procedural regulations, public procurement objectives will likely be attained (Chew & Xavier, 2012).

## Procurement Irregularities

Though comprehensive procedural control has been in place to secure full compliance from procurement officers, the public procurement cycle is always affected by a myriad of risks (OECD, 2016). Non-compliance with procurement procedures has been phenomenal in Malaysian local authorities (Kan, 2016). Based on the latest findings of the National Audit Department Malaysia (2017), the extent of compliance to procurement procedures is only 28%. The auditor general also highlighted many other poor procurement outcomes, i.e., cost overruns, project delay, shoddy workmanship, work abandonment etc. (National Audit Department Malaysia, 2018; National Audit Department Malaysia, 2019).

## Irrationality in Public Procurement

Kuchina-Musina *et al.* (2020) stated that public procurement decision making largely adopts Simon's means-end hierarchy model. Nevertheless, these decisions are made with less accentuation of the end results, with the outcomes mostly unknown at the point of procurement. However, similarly to most experts, procurement officers tend to believe they have absolute control of their decision-making process and its outcomes. This is a fallacy as their procurement behaviours are largely influenced by their cognition and susceptible to cognitive bias (Dror, 2020; Kahneman & Klein, 2009).

The public procurement system tends to assume that the officers have perfect information from the market, i.e., typical prices, cost structures, the availability of various supplies, major market players, etc. In reality, the procurement officers rely only on limited market knowledge in making a decision (Csáki, 2006), having little time to engage themselves in expansive cognitive deliberation, and therefore may prepare to settle just for good enough choices (Kuchina-Musina *et al.*, 2020). Simon (1976) has propounded that ordinary individual are not capable of optimisation. They are prone to bypass stressful and demanding cognitive strain. In addition, they are often emotionally driven and thus vulnerable to many heuristic biases, lowering the procedural rationality of their decision making, to the extent of making irrational decisions (Campitelli & Gobet, 2010).

According to Jurisch *et al.* (2013), the issues of procurement irregularities have attracted substantial public attention due to budget constraint and demand for improved performance in the government sector. This underscores the need to investigate the level of procedural rationality and its effect on procurement outcomes. A predictive model of procurement irregularities is proposed. The model would examine the correlation of procedural rationality in procurement procedures with its outcome – procurement irregularities. The model would

include three predecessors of procedural rationality, namely accountability, prior knowledge, and work experience.

### Accountability

Accountability is defined by Lerner and Tetlock (1999) as "the implicit and explicit expectation that one may be called on to justify one's beliefs, feelings, and actions" (p. 255). As for public accountability, a person is answerable to the public for his actions, decisions, policies, expenditures, etc. (Bovens, 2005). It is pressure that impels an individual to substantiate his decision (Doney & Armstrong, 1996). Aucoin and Heintzman (2000) opined that public accountability would assure good performance and constant improvement in public administration. This is important for gaining public and private trust where government expenditure is properly managed (Schooner & Yukins, 2009). This can be attained if public officers maintain high accountability in exercising procurement functions. Soudry (2007) expressed that less accountability would likely result in procurement officials adopting relatively less effort in performing their tasks.

## HYPOTHESIS DEVELOPMENT

The decision environment with high accountability exerts the pressure to be correct (Rausch & Brauneis, 2014) and substantially reduces decision bias (Tetlock *et al.*, 1989). Decision makers who are accountable for decision outcomes would adopt greater analytical and sophisticated decision making approaches or higher procedural rationality (Kaufmann et al., 2009). These mental efforts are necessary to justify their decisions' outcomes with others, since they are highly concerned about how they will be assessed (Carnevale & Pegnetter, 1985), and that would bear an impact on their job competencies (Simonson & Nye, 1992) and job positions (Tetlock *et al.*, 1989). Huber and Seiser (2001) confirmed that accountability results in greater endeavour (i.e., more time consumed on tasks) and more usage of information (i.e., information searching from the database). Therefore, individuals would process information more cautiously and exhaustively if they need to prove their judgment to third parties (Wouters *et al.*, 2009). They will spend more effort in data acquisition (Doney & Armstrong, 1996) as well as data collection (Siegel-Jacobs & Yates, 1996). Hence, we suggest:

**H1**: Accountability (ACC) is positively correlated with procedural rationality (PRC).

### Prior Knowledge and Procedural Rationality

Prior knowledge is the information kept in memory – a crucial factor in the human information processing model (Brucks, 1985). People with less or no prior knowledge of a product may require more time in assessing its features to establish a choice standard. In contrast, less time is required if a person possesses prior knowledge of the product and employs his previous standards in making a decision (Bettman & Park, 1980). Prior knowledge allows individuals to process new information with lesser thinking effort, thereby leaving extra resources for employing more complex decision strategies (Johnson & Russo, 1984). Comparatively, without prior knowledge, individuals have to rely on common problem-solving approaches (e.g., means-ends analysis) that creates enormous cognitive load and consumes more working memory resources (Kalyuga, 2011). This supposition may coincide with the finding that identifies a positive correlation between product familiarity and procedural rationality (Riedl *et al.*, 2013). Therefore, we suggest:

**H2**: Prior knowledge (PKW) is positively correlated with procedural rationality (PRC).

### Procedural Rationality and Procurement Irregularities

Within the public procurement context, Wilson *et al.* (2001) stated that purchasing personnel largely use heuristics in resolving purchasing problems. They employ substantive rationality in decision making at the decision evaluation stage (Smith & Taylor, 1985). Specifically, they use a combination of attribute evaluation and relative weights (Patton, 1996) and informal decision rules guided by their experience (Johnston & Lewin, 1996). Klein and Yadav (1989) suggested that the greater procedural rationality would consume more cost but producing better decision outcomes. In contrast, lower procedural rationality is generally heuristic in nature, which acquires the bare minimum of information on possible options. Thus, it requires less effort and time but at the expense of poor decision outcomes, which may lead to procurement irregularities. Hence, we suggest:

> **H4**: Procedural rationality (PRC) is negatively correlated with procurement irregularities (IRR).

## PREDICTIVE MODEL

Figure 2 is the predictive model of procurement irregularities. It depicts hypotheses H1, H2, H3 and H4. The model builds on the notions of bounded rationality (Simon, 1987) and procedural rationality (Simon, 1976). Due to the bounded rationality of procurement officers, they must rely on comprehensive procurement procedures in making procurement decisions – the path of procedural rationality. Their accountability, prior knowledge and experience would affect their level of procedural rationality employed in their decision making, which ultimately would impact the likelihood of procurement irregularities.

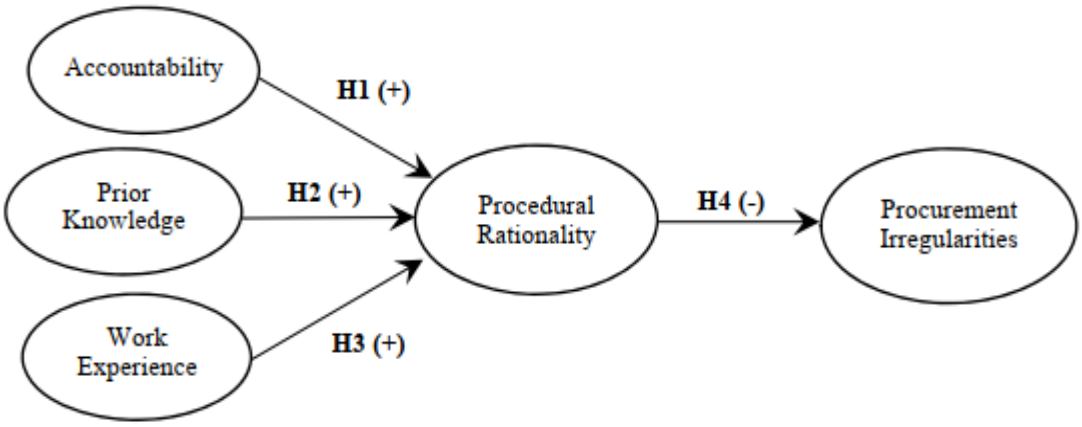


**Figure 2: Predictive Model**

## RESEARCH METHODOLOGY

This research adopted the quantitative approach. A hypothesised model was established based on various theories from the fields of cognitive and behavioural science. The model was then tested empirically via structural equation modelling (SEM). The measurement items are adapted from Riedl *et al.* (2013) for accountability (4 items) and prior knowledge (3 items) constructs. Measurement scales for procedural rationality (7 items) were adapted from (Kaufmann *et al.*, 2012). Non-probability sampling was used since it is convenient and represents some characteristics of the selected respondents (Creswell, 2014).

The respondents were public officers engaging in the procurement decision process within Malaysian local authorities, i.e., city hall, municipal council, district council and others (Table 1). A total of 1035 questionnaires were distributed, of which 322 were returned. They were filtered to exclude any invalid and uncompleted responses. This meant that 33 questionnaire sets were discarded due to being incomplete. In total, there were 289 fully completed questionnaire sets, equivalent to a 27.9% response rate. Of the respondents, 80.3% possessed tertiary degrees and had no difficulties in understanding the questionnaires. They had also been engaging in public procurement decision-making in the past 12 months.

**Table 1: Respondent Profile**

| Profile | Category | Frequency | Percentage |
|---|---|---|---|
| **Organisation type** | City Hall | 44 | 15.2 |
| | Municipal Council | 85 | 29.4 |
| | District Council | 152 | 52.8 |
| | Others | 8 | 2.8 |
| **Highest education level** | Doctorate | 2 | 0.7 |
| | Masters | 35 | 12.1 |
| | Bachelors | 195 | 67.5 |
| | Diploma | 16 | 5.5 |
| | Certificate | 29 | 10.0 |
| | Others | 12 | 4.2 |
| **Job position** | Engineer | 113 | 39.1 |
| | Quantity Surveyor | 76 | 26.3 |
| | Architect | 18 | 6.2 |
| | Secretary | 10 | 3.5 |
| | Administrator | 44 | 15.2 |
| | Others | 28 | 9.7 |

## DATA ANALYSIS AND RESULTS

### Assessment of the Measurement Model

The assessment of the measurement model involves Confirmatory Factor Analysis (CFA), in which convergent validity and discriminant validity were performed to measure the constructs' validity. Convergent validity is defined by Benitez *et al.* (2020) as "the extent to which the indicators belonging to one latent variable actually measure the same construct" (p. 8). It was assessed by Composite Reliability (CR) and Average Variance Extracted (AVE). When the square root of AVE exceeds the correlation, there is discriminant validity. Discriminant validity ensures that a construct measure is statistically sufficiently unique and that it does not overlap with other phenomena of interest represented by other constructs in a structural equation model (Henseler *et al.*, 2015). Table 2 illustrates the findings of loading and cross-loading among the variables through the Smart Partial Least Square statistical analysis technique. The cut-off value for loading was 0.5 (significant) as Hair *et al.* (2010) recommended. The researchers removed all the lower loading value items, which are less than the cut-off value of 0.5.

As presented in Table 3, all CR fulfilled the recommended value of 0.7. The Cronbach's alpha values also exceeded the ideal value of 0.7 as suggested by Hwa *et al.* (2018), indicating that

the model constructs were adequately convergent. Theoretically, the AVE value should exceed the threshold level of 0.50 (Halawi *et al.*, 2008). As shown in Table 2, the AVE of each model construct exceeded the acceptable level of 0.50 and the item loadings of each construct ranged from 0.647 to 1.000, exceeding the acceptable value of 0.50 as recommended by Hair *et al.* (2010). On average, all the latent variables in this research could explain more than half of the variance of the indicators (Karim, 2009). Conclusively, the research model has attained good convergent validity (Bagozzi & Yi, 1988), where all indicators have a greater load on the hypothesis factor.

**Table 2: Loading and Cross Loading**

| Profile | ACC | PKW | EXP | PRC | IRR |
|---|---|---|---|---|---|
| **ACC_10** | 0.807 | 0.499 | 0.543 | 0.590 | -0.378 |
| **ACC_11** | **0.838** | 0.494 | 0.482 | 0.567 | -0.268 |
| **ACC_8** | **0.819** | 0.447 | 0.496 | 0.546 | -0.267 |
| **ACC_9** | 0.822 | 0.436 | 0.460 | 0.522 | -0.278 |
| **PKW_10** | 0.458 | **0.875** | 0.564 | 0.623 | -0.465 |
| **PKW_8** | 0.462 | **0.854** | 0.574 | 0.604 | -0.500 |
| **PKW_9** | 0.559 | **0.867** | 0.629 | 0.682 | -0.514 |
| **WEX_3** | 0.605 | 0.682 | **1.000** | 0.791 | -0.584 |
| **PRC_1** | 0.541 | 0.491 | 0.560 | **0.735** | -0.464 |
| **PRC_2** | 0.509 | 0.591 | 0.651 | **0.799** | -0.492 |
| **PRC_3** | 0.530 | 0.607 | 0.642 | **0.765** | -0.572 |
| **PRC_4** | 0.484 | 0.542 | 0.602 | **0.758** | -0.549 |
| **PRC_5** | 0.429 | 0.478 | 0.522 | **0.647** | -0.314 |
| **PRC_6** | 0.500 | 0.538 | 0.592 | **0.783** | -0.510 |
| **PRC_7** | 0.581 | 0.626 | 0.599 | **0.784** | -0.539 |
| **IRR_1** | -0.258 | -0.342 | -0.411 | -0.491 | **0.727** |
| **IRR_2** | -0.219 | -0.410 | -0.449 | -0.516 | **0.739** |
| **IRR_3** | -0.311 | -0.444 | -0.442 | -0.488 | **0.744** |
| **IRR_4** | -0.331 | -0.468 | -0.483 | -0.560 | **0.744** |
| **IRR_5** | −0. 283 | −0. 485 | −0. 459 | −0. 494 | **0.753** |
| **IRR_6** | −0. 225 | −0. 371 | −0. 430 | −0. 449 | **0.738** |
| **IRR_7** | −0. 314 | −0. 441 | −0. 408 | −0. 445 | **0.691** |
| **IRR_8** | −0. 173 | −0. 367 | −0. 316 | −0. 389 | **0.729** |

**Note:** Bold values are loadings for items that are above the recommended value of 0.5, and an item's loadings on its own variable are higher than all of its cross-loadings with other variables.

**Table 3: Results of Measurement Model**

| Measurement Items | | Cronbach's Alpha | Loading Factor | Composite Reliability (CR) | Average Variance Extracted (AVE) |
|---|---|---|---|---|---|
| ACC | ACC_10 | 0.833 | 0.807 | 0.892 | 0.675 |
| | ACC_11 | | 0.838 | | |
| | ACC_8 | | 0.819 | | |
| | ACC_9 | | 0.822 | | |
| PKW | PKW_10 | 0.833 | 0.875 | 0.899 | 0.749 |
| | PKW_8 | | 0.854 | | |
| | PKW_9 | | 0.867 | | |
| EXP | WEX_3 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRC | PRC_1 | 0.541 | 0.735 | 0.902 | 0.569 |
| | PRC_2 | | 0.799 | | |
| | PRC_3 | | 0.765 | | |
| | PRC_4 | | 0.758 | | |
| | PRC_5 | | 0.647 | | |
| | PRC_6 | | 0.783 | | |
| | PRC_7 | 0.581 | 0.784 | 0.599 | 0.784 |
| IRR | IRR_1 | 0.877 | 0.727 | 0.903 | 0.538 |
| | IRR_2 | | 0.739 | | |
| | IRR_3 | | 0.744 | | |
| | IRR_4 | | 0.744 | | |
| | IRR_5 | | 0. 753 | | |
| | IRR_6 | | 0. 738 | | |
| | IRR_7 | | 0. 691 | | |
| | IRR_8 | | 0. 729 | | |

**Note:** (a) Composite Reliability (CR) = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (square of the summation of the error variances)}
(b) Average Variance Extracted (AVE) = (summation of the square of the factor loadings) / {(summation of the square of the factor loadings) + (summation of the error variances)}

According to Voorhees *et al.* (2015), the square root of the AVE for a given construct was compared with the correlations between that construct and all other constructs to establish discriminant validity. The discriminant validity was examined through the Fornell and Larcker's (1981) criterion (Table 5) and Heterotrait-Monotrait Ratio (HTMT) (Table 6). The threshold value of HTMT was less than 0.85 (Kline, 2011) and 0.90 (Gold, Malhotra, & Segars, 2001), indicating that discriminate validity is valid in this study.

**Table 4: Result Summary of the Model Constructs**

| | Measurement Items | Standardised Estimate | t-value |
|---|---|---|---|
| ACC | ACC_10 | 0.807 | 39.473 |
| | ACC_11 | 0.838 | 37.833 |
| | ACC_8 | 0.819 | 42.632 |
| | ACC_9 | 0.822 | 37.673 |
| PKW | PKW_10 | 0.875 | 59.581 |
| | PKW_8 | 0.854 | 54.643 |
| | PKW_9 | 0.867 | 73.406 |
| EXP | WEX_3 | 1.000 | 0.000 |
| PRC | PRC_1 | 0.735 | 19.481 |
| | PRC_2 | 0.799 | 37.661 |
| | PRC_3 | 0765 | 25.957 |
| | PRC_4 | 0.758 | 23.849 |
| | PRC_5 | 0.647 | 15.213 |
| | PRC_6 | 0.783 | 29.637 |
| | PRC_7 | 0.784 | 29.329 |
| IRR | IRR_1 | 0.727 | 19.151 |
| | IRR_2 | 0.739 | 23.395 |
| | IRR_3 | 0.744 | 22.657 |
| | IRR_4 | 0.744 | 27.808 |
| | IRR_5 | 0. 753 | 23.363 |
| | IRR_6 | 0. 738 | 23.157 |
| | IRR_7 | 0. 691 | 18.999 |
| | IRR_8 | 0. 729 | 16.030 |

**Table 5: Fornell-Larcker Criterion for Discriminant Validity of Constructs**

| | ACC | EXP | IRR | PRW | PRC |
|---|---|---|---|---|---|
| **ACC** | 0.821 | | | | |
| **EXP** | 0.605 | 1.000 | | | |
| **IRR** | -0.364 | -0.584 | 0.733 | | |
| **PKW** | 0.573 | 0.682 | 0.570 | 0.865 | |
| **PRC** | 0.679 | 0.791 | -0.659 | 0.737 | 0.754 |

**Note:** Diagonals represent the square root of the average variance extracted while the other entries represent the correlations.

**Table 6: HTMT Criterion for Discriminant Validity of Constructs**

| | ACC | EXP | IRR | PRW | PRC |
|---|---|---|---|---|---|
| **ACC** | | | | | |
| **EXP** | 0.658 | | | | |
| **IRR** | 0.417 | 0.618 | | | |
| **PKW** | 0.680 | 0.746 | 0.663 | | |
| **PRC** | 0.790 | 0.846 | 0.738 | 0.859 | |

**Note:** HTMT < 0.85 (Kline, 2011), HTMT < 0.90 (Gold *et al.* 2001)

## Assessment of Structural Model

Table 7 and Figure 3 postulate the findings of the analysis. The path coefficient measures the effect in a dependent construct via standard deviations when an independent construct is increased by one standard deviation while maintaining the remaining constructs constant (Benitez *et al.*, 2020). The path coefficient (β) and t-statistics (t-value) of each hypothesis were determined by bootstrapping. This is a nonparametric approach to gauge the accuracy of PLS estimates (Chin, 2010). To assess the path coefficient (β) and hypotheses, 500 samples were used with 0 cases per sample. The result confirmed H1 that the ACC is positively correlated with PRC (β = 0.240, t-value = 4.179). The results also showed a standardised Beta, 0.297 from PKW to PRC with t-value = 5.150, and standardised Beta, 0.443 from EXP to PRC with t-value = 9.618. The analysis supported the path from PRC to IRR with standardised Beta -0.659 and t-value 19.553. Conclusively, the findings supported hypotheses H1, H2, H3, and H4.

As recommended by Hair *et al.* (2017), both the coefficient of determination ($R^2$) and predictive relevance (Q2) must be considered in assessing the performance of a predictive model. The $R^2$ measures the predictive power of a structural model. It represents the share of variance explained in a dependent construct (Benitez et al., 2020). The $R^2$ value ranges from 0 to 1, where higher values indicate greater predictive accuracy. For instance, the $R^2$ value of the PRC is 0.733 where accountability, prior knowledge and experience explain 73.3% of variance in procedural rationality.

The Q2 value is used to assess predictive relevance and is generated via blindfolding procedure. It is a sample re-use method that systematically removes data points and generates a prediction of their original value (Hair *et al.*, 2017). If the prediction is close to the original value, the model is considered as having a high predictive relevance. The greater the positive value of Q2, the higher the predictive relevance. The Q2 value > 0 suggested that the value is well constructed, and the construct demonstrates predictive relevance. Values of 0.02, 0.15, and 0.35 show a relative measure of small, medium and large predictive relevance. In this case, the Q2 value of the PRC and IRR is 0.733 and 0.215 respectively. Both values are positive and more than 0.35, indicating that these constructs have strong predictive relevance to the model.

The overall fit of the path model is tested via PLS path analysis modelling. GoF is a global fit measure. It is the geometric mean of average communality and average R square (especially endogenous variables) (Tenenhaus *et al.*, 2005). The formula for calculating GoF is:

$$\text{GoF} = \sqrt{\overline{AVE} + \overline{R^2}}$$

In this research, the GoF value is 0.554 (R squared = 0.435, average AVE = 0.706) and is more than the largest cut-off value, 0.36. The suggested values of GoFsmall = 0.10, GoFmedium = 0.25, and GoFlarge = 0.36 are the baselines for verifying the proposed PLS model (Wetzels *et al.*, 2009). The results also demonstrated that this model possesses a greater explaining power and it is thus acceptable.

**Table 7: Path Coefficient and Hypothesis Testing**

| Hypothesis | Relationship | β - Coefficient | t-value | Decision |
|---|---|---|---|---|
| **H1** | ACC ≥ PRC | 0.240 | 4.179 | Supported |
| **H2** | PKW ≥ PRC | 0.297 | 5.150 | Supported |
| **H3** | EXP ≥ PRC | 0.443 | 9.618 | Supported |
| **H4** | PRC ≥ IRR | -0.659 | 19.553 | Supported |

**Note:** t-value >1.96 (p < 0.05*); t-value >2.58 (p < 0.01**)

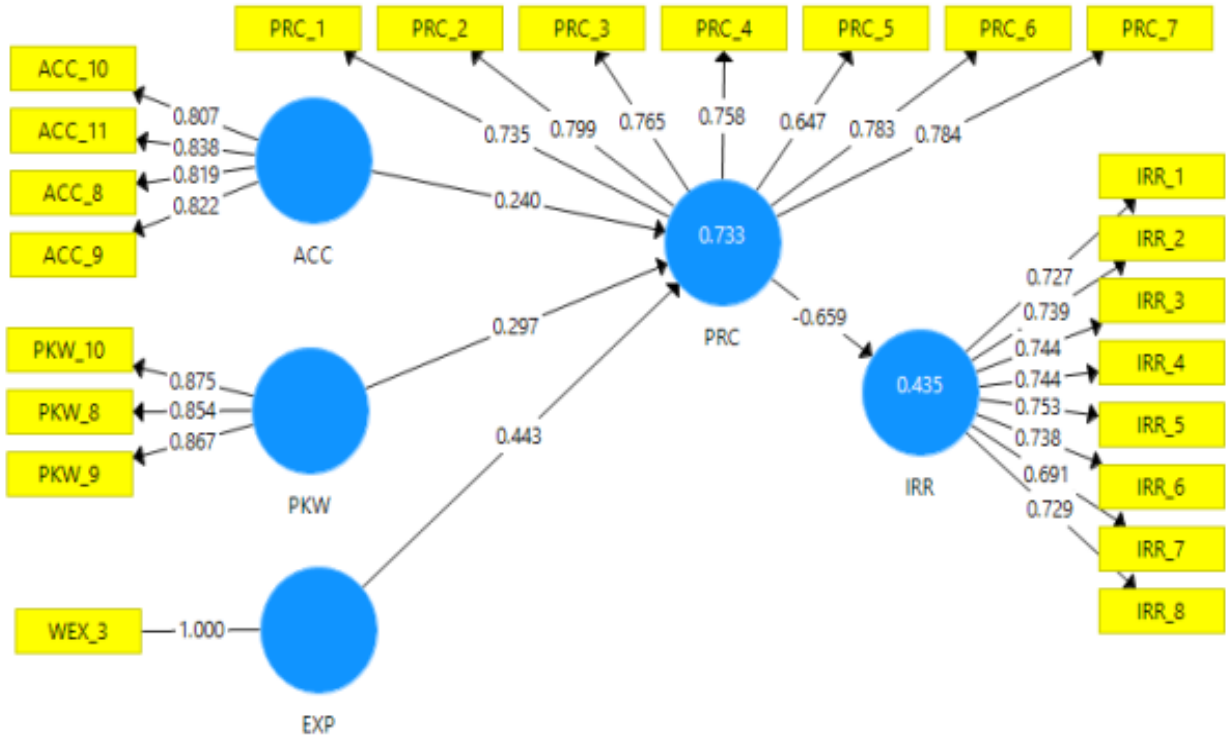


**Figure 3: Results of the Path Analysis**

## DISCUSSION

This study aimed to investigate the factors that affect the procedural rationality of public procurement officers in decision making. The results show that three antecedents, namely work experience, prior knowledge, and accountability, accounted for procedural rationality in decision making. Work experience has the strongest effect among other antecedents (β = 0.443). Experienced procurement officers are more capable of processing a larger amount of information (Mao & Benbasat, 2000), and analysing it more thoroughly (Sanbonmatsu et al.,

1992). They are quick to recognise the salient features of problem structures (Gary *et al.*, 2012) and are more adept in employing heuristics for general problem solving (Dane, 2010).

Prior knowledge has a strong effect (β = 0.297) on procedural rationality. This is consistent with Gursoy's (2003) that prior knowledge facilitates the search and analysis of information. When facing uncertain decision outcomes, decision makers who are familiar with extra information would set the matter to a monotone decision problem and resort to routine decision making mode (Sinclair-Desgagne, 2019). This is especially true in public procurement, where standard operating procedures largely shape the decision environment. More knowledgeable officers would tend to adhere to procedural regulations in procurement decisions.

Accountability has the least effect (β = 0.240) on procedural rationality among the three antecedents. Dalla Via *et al.* (2019) agreed that accountability improves information search effort and decision quality. Individuals who are held accountable for justifying their decisions process demonstrate more extensive information search efforts (McAllister *et al.*, 1979), and more systematic information processing (De Dreu *et al.*, 2006). Hence, accountability positively induces procedural rationality in the decision process.

In addition, the procedural rationality of a decision process involves the desire to gather and analyse all relevant information, finding the most optimal decision under the given circumstances (Simon, 1976). This construct is negatively correlated with procurement irregularities (β = -0.659), indicating that the lower the procedural rationality, the higher the probability of procurement irregularities, and vice versa.

In the local government of Malaysia, the decision environment is largely routine and structured (Ngah *et al.*, 2012). It promotes compliance and transparency whilst lowering individual accountability and risk for scrutiny (Grimley & Burnard, 2021). Alessandri (2008) suggested that at lower levels of perceived risk, decision processes would be less information intensive and analytical, resulting in reduced level of procedural rationality. Specifically, the officer's knowledge and experience facilitate project risk identification to establish worldviews whereby new decision contexts are compared and interpreted with reference to the previous situation (Vosniadou & Ortony, 1989).

In the real world, procurement decisions are made within a limited time and with imperfect information. It is impossible to conduct a meticulous search and to select a project satisfying optimality along with all the requirements. Such evaluation itself is beyond the cognitive ability of an ordinary man – bounded rationality.

Instead, the focus should be on how the assessment is done – the procedural rationality of assessment. In reality, there are numerous decision points for contemplations, of which some may be indifferent or oblivious to certain risks, mostly due to the routine nature of the evaluation task. Hence, simplification is made to reduce the number of options – the satisficing rule. It ceases when acceptable options are found. Therefore, the outcome would not be the "best" solution rather than the "good enough solution".

In addition to cognitive limitation, procurement officers may have been complacent with the choice deriving from the standard procedure. The consideration made at the awarding stage is often favourable to the previous choice. In other words, their procedural rationality behaviour may often fall short of expectation, which in turn means that the low procedural rationality in the decision process would likely result in more procurement irregularities.

## Theoretical Contribution

This study offers a new understanding of the compliant behaviour of public procurement officers from the cognitive psychology perspective. The findings offer strong empirical support for the predictions of the correlation between procedural rationality and procurement outcome. The tested antecedents are capable of offering a more holistic measurement of procedural rationality constructs. This gives scholars a new way to reason empirically observed procedural rationality performed in a procurement setting.

## Mangerial Implication

Within procurement committees, the officers do not decide in isolation from each other. Instead, their decisions are made collectively. The interaction among committee members invariably affects the individuals' thinking on interpreting information and assessing risks. In particular, they are fully insulated from any external party, where their decisions are not duly advised by any technical advisors. Without input from an external party, incompetency in procurement officers would likely undermine the quality of deliberation, resulting in poor project outcomes. Hence, from the managerial standpoint, the conventional means of controlling behaviours via comprehensive rules is neither adequate nor effective.

As part of quality assurance and control, we suggest a strict code of procurement practice in which only officers with certain credentials (experience and knowledge) and work ethics (related to accountability) are assigned to procurement tasks. Generally, any procurement irregularities would only be discovered when the project performance is audited at the post-contract stage, or the project outcomes are reviewed at the post-completion stage. Hence, the procurement officers should be held accountable for their non-compliant behaviour in procurement regulations and the ultimate outcome of their procurement decisions. This may hinder the inadvertent award of mediocre contractors or suppliers who may be problematic at a later stage.

## Limitation

This study only considered procurement decision making in Malaysian local authorities and excluded other public entities. Hence, our results are not generalisable to the Malaysian public sector. In addition, it disregards the impact of external factors, such as trade lobbying, political interference, and corruption, which tend to influence the procurement process. In addition, the survey questionnaires are designed for assessing the ethical perception, behaviour, conduct, and self-performance of public officers. Obtaining truthful or authentic responses is therefore often challenging. The respondents may be highly sensitive to questions on ethics and prone to social desirability response bias which may undermine the findings.

# CONCLUSION

The work environment of public officers is overburdened with procedures, rules, regulations, and policies for which they are held accountable (Halachmi, 2014). This is particularly true in Malaysian public procurement, where the rules and procedures of procurement substantially control the officers. This includes the functions to be undertaken, purposes to be achieved, the overall decision approach, etc. (Chew & Xavier, 2012). Though the administrative procedure is an important means for assisting the officers in producing rational decisions corresponding to the national procurement objectives, we questioned the assumption that public officers can fully comply with the procurement procedure. Under the notion of bounded rationality, the mental capacity of an ordinary individual is limited, where optimisation is simply impossible.

It is thus more appropriate to advance our understanding of how procedural rationality would influence the compliance of public officers on the rules and regulations of procurement.

Under the assumption of bounded rationality, decision-making is facilitated by procedures whereby the experience, prior knowledge, and accountability of procurement officers would affect the level of procedural rationality employed in their decision process, ultimately impacting the procurement outcome.

The empirical results supported that accountability, prior knowledge, and work experience are all associated positively with the procedural rationality of decision makers. More accountable procurement officers, with more prior knowledge and experience, tend to be more adaptive to the standard operating procedure of the decision process (Riedl *et al.*, 2013).

The results also suggested the correlation between procedural rationality and procurement irregularities correspond to the finding of Klein and Yadav (1989) that high procedural rationality would significantly reduce the procurement irregularities, and low procedural rationality would likely increase procurement irregularities (Stanczyk *et al.*, 2015). In essence, the policymakers should take into account the cognitive limitation of public officers who are entrusted with procurement decision making. This study is significant since it provides insights into the determinants of procedural rationality that ensure good procurement outcomes.

A future researcher might consider incorporating an element of outcome accountability rather than process accountability in the procurement decision making system. By purposively considering outcome accountability in their decisions, the need for answering to poor decision outcomes would impact their work performance, imposing the sense of ultimate responsibility. Such studies could then be empirically observed in iterative decision making moves on procurement tasks. Such experiments will further refine the individuals' procedural rationality assumptions about whether and how outcome accountability affects their cognitive effort in deliberation.

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