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Subjective and Projective Measures of Thesis Writing Procrastination: Real World and *The Sims* World.

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Although it has been studied since 1980s, the theoretical framework for procrastination has just been comprehensively developed about two decades later. This study applied Temporal Motivation Theory (TMT) as a theoretical framework to develop thesis writing procrastination instruments, using self report and *Sim's* behavior observation methods. Self-report results of 232 undergraduate students have fulfilled psychometric norms, concerning either the reliability or validity aspects. Observation of *Sim's* behaviors, performed by 48 students, also fulfilled some of the psychometric criteria. The discovery of contradictory patterns of academic activities in the real world against *The Sims 2* World was perceived as evidences of basic value differences and manifestation of defense mechanism. Inclusion of subject's responses on *The Sims 2* game play pattern scale in the hierarchical linear regression equation improved the prediction power toward latency of thesis completion.

Keyword: multi-methods, procrastination, Temporal Motivation Theory, *The Sims*, thesis

Sekalipun telah dipelajari sejak 1980-an, kerangka kerja teoretis penunda-nundaan (prokrastinasi) baru tersusun secara komprehensif sekitar dua dekade kemudian. Penelitian ini menggunakan kerangka kerja teoretis Teori Motivasi Temporal (*Temporal Motivation Theory*/TMT) untuk mengembangkan alat ukur penunda-nundaan pengerjaan tugas akhir dengan laporan diri dan pengamatan perilaku *sim*. Hasil pengukuran laporan diri terhadap 232 mahasiswa telah memenuhi kaidah psikometris baik dari segi reliabilitas maupun validitas. Hasil pengamatan terhadap perilaku *sim* yang dikendalikan 48 mahasiswa juga telah memadai dari segi reliabilitas dan validitas. Ditemukannya pola berlawanan antara pengerjaan kegiatan akademik pada dunia nyata dan dunia *The Sims 2*, dimaknai sebagai bukti adanya perbedaan nilai dasar serta perwujudan mekanisme pertahanan diri. Penambahan prediktor berupa pola bermain *The Sims 2* berhasil meningkatkan daya prediksi terhadap latensi penyelesaian skripsi.

Kata kunci: metode pengukuran majemuk, penunda-nundaan, prokrastinasi, skripsi, Teori Motivasi Temporal, *The Sims*.

Procrastination measurement has been conducted since 1980s (Schouwenburg, Lay, Pychyl, & Ferrari, 2004). Its theoretical framework was comprehensively developed in about two decades since its inception (Steel, 2002; van Eerde, 2003). The theoretical framework were developed by Steel and König (2006), based on Temporal Motivation Theory (TMT).

TMT approach believes that thesis writing procrastination happens due to the low level of its subjective utility (Lowenstein & Prelec, 1992). Subjective utility tends to decline temporarily when the deadline is far in the future, and return to its original level when the deadline is near. This understanding was supported by the graduation record in the Faculty of Psychology, Universitas Surabaya (FP UBAYA) in academic year 2000-2007. About 59.3% of 1502 graduates completed thesis writing in the last month of the graduation registration deadline.

Subjective utility was influenced by four components (Gröpel & Steel, 2008, Steel, 2007; Steel & König, 2006). Those components are expectancy, value, sensitivity to delay in receiving the reward (usually called sensitivity to delay), and time delay to the reward

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(usually called time delay). Those four were assumed to interact synergistically (multiplicative).

Steel (2007) and Steel and König (2006) proposed two important things in procrastination measurement. The first is the importance of measuring four TMT's components simultaneously as a validation of TMT (Tuckman, 1991). The second thing is procrastination measurement using behavior observation method, especially with the assistance of a computer game known as *The Sims*.

As far as the author knows, until the start of this study, there is not any single/sole instrument, especially as a self-report, which was constructed based on TMT, as it was also personally admitted by Steel (2007). One of the reasons is the recentness of TMT (Gröpel & Steel, 2008; Steel & König, 2006).

In order to concentrate on the focus of this study, there were some constraints (boundaries) about the theoretical framework, procrastination domain, and subject. Theoretical framework was developed upon Temporal Motivation Theory (TMT). Procrastination domain covers thesis completion, due to five considerations. The first is theoretical fitness of task as behavioristic indicator of procrastination (Steel, 2007). The second is high level in frequency (Kingofong, 2004). Next, the third is universality of the problem (Clark & Hill, 1994; Jaradat, 2004; Lovitts & Nelson, 2000; Owens & Newbegin, 2000; Popoola, 2005; Yaabub, 2000). The fourth is huge losses (Arini, 2006; Kohun & Ali, 2005; "Sejumlah PTS Diduga," 2006; "Depdiknas Sulit Atasi," 2005; Umam, 2005). Finally, the fifth is pressing need of problem solving (Braunstein, 2004; Darmono & Hasan, 2003; Good, 2002; Indriati, 2003; Lang, 2005; Varney, 2003). The subjects employed here are undergraduate students. This restriction was taken due to three considerations: (a) the largest population, (b) higher group's homogeneity, compared to the master and doctoral students, and (c) high variation in measurement objects and methods.

The problem statement was "Whether the procrastination instruments have fulfilled the psychometric principles as psychological measurements." This question arises from the purpose to develop instruments, using self-report and behavior observation methods. There were two benefits, enrichment of procrastination nomological network and availability of new instrument to measure thesis writing procrastination.

Thesis Writing Procrastination

Definition of Procrastination

Procrastination happens due to low level of subjective utility (Gröpel & Steel, 2008; Steel, 2007; Steel & König, 2006). Procrastination is defined as an inclination to prolong an intended task due to the low level of subjective utility. Delay in doing an easy, violating personal value, and low time delay is not procrastination.

Measurement of Procrastination

Self-Report. Low correlation between results of procrastination measurements (Wadkins, 1999), was indicators of definition and indicator dissimilarity (Milgram & Naaman, 1996; Milgram, Dangour, & Raviv, 1992). Correlation between Adult Inventory of Procrastination (AIP) and Decisional Procrastination Questionnaire (DPQ) were only $r = .40$ (Steel, 2003). It happens due to dissimilarity in the focus of measurement, which is task procrastination and decisional procrastination (Vestervelt, 2000).

Two common problems in using a self-report to measure procrastination are criterion validity (*Ferrari, Johnson, & McCown, 1995*) and construct validity (Steel, 2003). Threats toward criterion validity emerge due to weak theoretical framework (van Eerde, 2003; Chu & Choi, 2005; Ferrari, 1993). Threats to construct validity emerge from the confusion in defining procrastination, delay, and time management (Steel, 2003).

Behavior Observation. Procrastination study usually takes place in the academic setting, from quizzes, term paper, attendance, participation in research, until receiving academic titles (Elvers, Polzella, & Graetz., 2003; McKean, 1990; Milgram, Mey-Tal, Levison, 1998; Muszynski & Akamatsu, 1991; Gunawinata, Nanik, & Lasmono, 2008; Steel, 2003; Tuckman, 1996). Fortunately, decision to use academic task as indicators was appropriate with four criteria which were proposed by Steel (2003), (a) decision to carry out the task, (b) clear time frame, (c) negative result, and (d) ability to predict risk for not doing (delay in doing the task).

THE SIMS 2

Similarity between *The Sims World* and daily life are not coincidental. *The Sims* creator (Will Wright) admitted that he had studied and applied psychology in studying and designing *The Sims* and *The Sims 2* (Kosak, 2004). He coined *simology* as a term to reflect Sim's psychology (Kramer, 2005).

Player's Self-Projection in *The Sims*

The Sims players can decide their Sim's physical appearance, personality, furniture and behavior. Many players project their life into *The Sims World* (Frasca, 2001;

Griebel, 2006), reflected through similarities in appearances, habits, and values (Curlew, 2005; Sicart, 2005).

Players can also try out unusual activities. Some players use their Sim to do "bad" things, which violate social norms or personal values (Griebel, 2006), such as having affairs or hurting another Sim. From the perspective of Schwartz Basic Value (1992, 1994, 2006, 2007), inclination to try new things was based upon Openness to Change value structure. This value structure consist three basic value, Hedonism, Stimulation, and Self-Direction.

Sim's behavior might be perceived as adaptation, consciously or unconsciously. As a conscious action, those efforts were based upon *Conservation* value structure (Schwartz, 1992, 2007). Unconscious adaptation was often labeled as defense mechanism (Gleser & Ihilevich, 1969; Zeigler-Hill & Pratt, 2007)

The Sims as a Psychological Measurement

Griebel (2006) reported statistically significant correlation between Big Five personality profile and Schwartz Value Survey with *The Sims* game play pattern. A person with high neuroticism level tends to postpone paying taxes, change career, and insult another Sim. Players with high openness to experiences tend to let their Sim spend more money and do pleasant things. Players who gave high value for wealth tend to acknowledge the importance of having more money for their Sim.

There are some problems in using *The Sims* as a psychological measurement. First, there are chances that players manipulate their game play. Second, there are difficulties to get response, due to facility constraints or lengthy participation (Griebel, 2006).

Temporal Motivation Theory

Components

TMT consists of five components, subjective utility (*tingkat kegunaan subjektif = TKS*), expectancy (*harapan keberhasilan = HK*), value (*nilai = N*), sensitivity to delay (*kepekaan pada penundaan = KP*), and time delay (*waktu tunda = WT*). Inter-component relations are presented at formula 1 (König & Steel, 2006; Steel, 2007; Gröpel & Steel, 2008).

$$TKS = \frac{HK \times N}{1 + (KP \times WT)} \qquad \text{(Formula 1)}$$

Note: 1 = constant number, to prevent equation producing infinite number when WT reach 0 (zero)

Subjective utility in the TMT approach categorized as multifaceted construct (Carver, 1989; Hull, Lehn, & Tedlie, 1991). Carver stated there were two approaches in perceiving multifaceted construct, as latent variable model or as multiplicative model. Hull, Lehn, and Tedlie have suggested the third model – the additive model. This model is a combination of those two previous models. This approach proposes that each component has its own unique contribution, but rejecting inter-component multiplicative interaction.

In multiplicative model, correlation tests using multiplicative composite scores are prohibited (Bagozzi, 1984; Busemeyer & Jones, 1983; Evans, 1991; Lubinski & Humphreys, 1990). Those scores conceal uniqueness of each facet and miss out the most important information regarding the existence of multiplication effect (J. Cohen, P. Cohen, West, & Aiken, 2003). Hierarchical linear regression/HLR was considered as a more appropriate statistical data analysis technique.

Application of TMT in Thesis Writing Procrastination

In TMT, subjective utility should have large negative correlation with procrastination. It means interaction pattern between TMT components and procrastination was contradictory. Some components, which positively correlated with subjective utility, were turn into having positive correlation with procrastination. Empirical framework is presented at Appendix A.

Standardized Instrument to Measure TMT Components

Search for standardized instruments was restricted to value and sensitivity to delay. It happens because those two components are general and relatively stable constructs (Elliot, 2002; Lay & Silverman, 1996; Lay, Kovacs, & Danto, 1998).

Value. The most prominent figure in value measurement is Shalom H. Schwartz. He focused on this subject since 1980s (Bussey, 2006) and participated in constructing three of the six discovered value instruments, which are *Portrait of Values Questionnaire*/PVQ (Schwartz, Melech, Lehmann, Burgess, & Harris, 2001*), Schwartz's Value Survey*/SVS (Schwartz, 1992), and *Short Schwartz's Value Survey*/SSVS (Lindeman & Verkasalo, 2005). The most recommended scale for inter-cultural use is PVQ. This recommendation based upon three considerations, strong theoretical basis, good psychometric characteristics, and practicality (Schwartz,

2003). PVQ has been translated into 21 languages (Schwartz, 2003), including *Bahasa Indonesia* (Hardman & Santosa, 2008; Prameswari & Herabadi, 2007; Widyaningsih, & Wulandari, 2007). In the end, it was decided to use PVQ as item reference source for value component.

Sensitivity to delay. Conceptually, this TMT component has strong connection with perseverance and self-control (Burns, Dittmann, Nguyen, & Mitchelson, 2000; Carden, Bryant, & Moss, 2004; Ferrari, Parker, Ware, 1992; Green, 1982; Rizvi, 1998; Rizvi, Prawitasari, & Soetjipto, 1997). Both constructs were measurement aspects of *conscientiousness* in the *Big Five* personality profile (Johnson & Bloom, 1995). As a result, search for item reference sources were focused on *Big Five* standardized instrument (Schouwenburg & Lay, 1995; Surijah & Sia, 2007).

The search for standardized instrument resulted twelve *Big Five* standardized instruments. Eight of those twelve instruments have more than 100 items. Scale with largest items is the Global Personality Inventory, which consists 300 items (Schmidt, Kihm, & Robie, 2002). Finally, the Big Five Inventory (BFI) was chosen due to the small number of items, adequate length of the items, and good internal reliability.

Procrastination Conceptual Model Using TMT

Real World: Thesis Writing Procrastination

Steel (March 14th, 2010, personal communication) stressed that four TMT components need not be correlated because they weren't indicators of a single latent variable (Appendix B). TMT components assumed to interact synergistically in determining subjective utility (Gröpel & Steel, 2008; Steel, 2007; Steel & König, 2006). Nevertheless, Steel also admitted that contradictory results often acquired in structural model evaluation. He even suggested a thorough model evaluation (March 21, 2010, personal communication). Steel's suggestion (2010) was accommodated and manifested in three structural models. Finally, the most supported model is a combination of latent variable and additive model (Appendix C).

The Sims 2 World: Academic Procrastination

In *The Sims*, Sim can only execute one order at a time. It means, there are always activities that was brought forward and delayed. TMT suggested that determination of activities order was based upon their subjective utility.

The Sims 2 Game Play Pattern Scale has been developed to complement understanding about Sim's procrastination. This scale has three components, Sim's control (*pengendalian Sim* = PS), Sim's academic performance (*prestasi akademik* = PA), and self-projection (*proyeksi diri* = PD). PA component is developed to measure the subjective utility of Sim's academic activity. Higher subjective utility resulted in higher duration and lower latency of academic activity, and in higher academic achievement/general procrastination scale = GPS (Appendix D).

Real World and *The Sims 2 World*: Multi-methods Measurement

Results of procrastination measurement using self-report are expected to be aligned with Sim's behavior observation. Both of them are also expected to be aligned with measurement results using standardized instruments and thesis writing latency (Appendix E).

Results of multi-method measurement of thesis writing procrastination were expected to reveal contradictory pattern between procrastinators and non-procrastinators. At procrastinators' group (high score on TKS), self-report results were expected to correlate positively with Sim's behavior observation. In contrast, at the non-procrastinator group (low score on TKS), self-report's result were expected to correlate negatively with Sim's behavior observation. This condition is believed to be embedding at value incongruence and defense mechanism.

Hypotheses

Based upon previously presented theoretical considerations and conceptual models, a major hypothesis and five minor hypotheses were proposed.

Major hypothesis: Thesis writing procrastination measurements based on TMT have fulfilled psychometric principles as psychological measurements.

Minor hypotheses:

1) Self-report has good internal reliability
2) Self-report results have internal structure that is aligned with theoretical framework.
3) Measurement using self-report has good construct validity.
4) Measurement using self-report has good criterion validity
5) Observation of Sim's behavior has good internal reliability.
6) Observation of Sim's behavior has good construct validity.

7) Observation of Sim's behavior has good criterion validity.
8) Multi-method measurement has good construct validity.
9) Multi-method measurement has good criterion validity.

Method

Identification and Operation of Variable

Thesis writing procrastination is defined as inclination to prolonged thesis writing due to low level of subjective utility. This construct was operated into score of thesis subjective utility (*tingkat kegunaan subjektif skripsi = TKSS*) and duration and latency of academic activity in the Sims 2.

Subject

Subjects were undergraduate students at FP UBAYA. Total number of students who were doing their thesis writing was 357 (March 7, 2007, Iswahyudi as the manager of the administration unit at FP UBAYA, personal communication). The lists already include the students who graduated during the first period of academic year 2007-2008.

Procedures of Scale Development

Scale development procedures were in accordance with the recomendations of the joint Commitee of *American Educational Research Association/*AERA, *American Psychological Association/*APA, and *National Council on Measurement in Education/*NCME (1999), Anastasi and Urbina (1997), Kline, (1986), Marnat, 1984, and also Netemeyer, Bearden, and Sharma (2003). These are: (1) construct definition and content domain, (2) blue-print development, (3) item collection and selection, (4) data collection, and (5) data analisis. These procedures were used for both measurement methods (Hersen & Bellack, 1988; Appendix F).

Self Report

Scale development might be regarded as explorative, that is, measuring procrastination predisposition in a community (Suryabrata, 1999). Thesis writing procrastination was manifested as low score of TKSS, which consisted of four components (Appendix G). There were two measurement constraints, procrastination area (thesis writing) and theoretical framework (TMT). Standardized instrument collection was conducted for value and sensitivity to delay. All items for expectancy and time delay were constructed based on conceptual model and item writing principles (Azwar, 1999; APA, 2010).

In order to speed up data collection and improve accuracy of data processing, a computer-based measurement was prepared. The program was named thesis utility test *(tes kegunaan skripsi = TKS*). This automaticity can reduce data processing period and eliminate chances of typing error. Data collection took place at the end of November until the beginning of December 2007, at Pusat Komputer Edukasi (Puskomed) UBAYA.

Measurement results were tested for internal reliability and internal structure. Reliability testing were conducted using two models, *Alpha Cronbach* and Mosier composite reliability (1943). All data analysis was performed using non-parametric techniques.

Behavior Observation

In behavior observation, thesis writing procrastination was manifested as predisposition to postpone doing academic activities in The Sims 2 world. Observations were conducted on four types of academic tasks, they are, writing term paper, doing assignments, attending classes, and doing final exam.

Observation focused on two components: duration and latency of conducting academic activities. In latency, observations were conducted on time to begin and complete academic task. There were also measurements conducted on subject's game play pattern.

Checklists were focused on Sim's individual and academic profiles. All information was obtained through digital recording of subject's game play using *TechSmith ® SnagIt ©: the Windows Screen Capture Utility* (version 8.1.0). This program recorded every image that was presented on the monitor screen during subject's playing period. Image recording took place every 3 seconds, due to very large number of images (more than 3000 images per subject) and size of the file.

Data collection using behavior observation took place in the middle of December 2007, at Puskomed UBAYA. Based upon early registration, there were 56 students who wanted to participate. Unfortunately, until the final session of data collection, only 48 subjects (85.714 %) participated in the project.

There were two reasons that undermined subjects' withdrawal. First, data collection conducted near the New Year's holiday. Second, students own intention to focus their time and effort in completion their own thesis. Beside the absence of certain applicants, some

technical problems reduced number of data to be analyzed statistically.

Statistical techniques used for behavior observation were similar to the statistical analysis of self-report. However, reliability testing for behavior observation was conducted using *Spearman-Brown split-half model*. As a mono-trait and multi-methods measurement, data analyses were also conducted to test congruence between self-report and behavior observation.

Results

The First Minor Hypothesis: Reliability of Self-Report

Alpha-Cronbach reliability testing on TKSS (.834) and PASS-S (.925) presented at Appendix H. Mosier composite reliability of TKS score is .775. With all reliability indices that already surpass acceptance level, the first minor hypothesis is accepted. Self-report measurements have a good internal reliability.

The Second Minor Hypothesis: Internal Structure of Self-Report

The measurement model of TKSS (Appendix I) showed large correlation between expectancy and value (r= .960), between value and sensitivity to delay (r = -.770) and between expectancy and sensitivity to delay (r=- .410). In contrast, time delay only has minor and insignificant correlation with the three other components. The existence of four error covariance at six sub-components (HKP, HKL, NN, NP, KP1, and WT2) indicated the existence of a unique association which is not represented by the four TMT components. However, this model was supported by data, as revealed by the low level of chi square χ^2= 17.335 (p = .239; DK=14), low level of RMSEA = .032, and high level of CFI = .990.

The Third Minor Hypothesis: Construct Validity of Self Report

The third minor hypothesis focused on construct validity of the self-report. Supporting evidence for construct validity was confirmed by the high correlation between self-report (TKSS) and standardized procrastination inventory (PASS-S). PASS-S score was extracted with PCA (*Principle Component Analysis*) procedure using SPSS to get 2 composite scores (PASS-S1 and PASS-S2) in order to get one single PASS-S score.

On the other hand, testing of the multiplicative model was conducted using hierarchical regression analysis/ HLR (Appendix J). Results of HLR have confirmed that addition of multiplicative composite score, as predictors were not statistically significant. It proved that there was not any multiplicative interaction among TMT's components. It means that the score on a component does not multiply the score on the other components.

Multiplicative model testing was followed by latent variable model testing. Model testing was conducted using partial aggregation approach. The result showed that time delay is not an indicator of thesis writing subjective utility (Appendix K).

The three components of TMT (HK, N, and KP) have large common contribution on PASS-S (γ=- .90). Error covariance between HK and N showed unique interaction between components. This covariance came from similarity of measurement object (attitude toward thesis writing).

As previously known that HK, N, and KP were TKSS indicators, model testing were followed by model testing using eclectic approach, which combined the latent variable and the additive model approach. The structural model modification was conducted by eliminating one-way straight line from TKSS toward WT and by adding one straight line from WT to PASS-S. This modification was conducted to measure WT's contribution on PASS-S (Appendix L).

Model fitness with data can be seen from the low chi square (χ^2=10.801; DK=7; p= .148), low RMSEA (.048), and high CFI (χ2= .980). There were no data supporting additive interaction between TKSS and WT. Meanwhile, WT retained due unique contribution on latency of thesis completion Appendix L).

In summary, the self-report results (TKSS) were used to predict PASS-S score. In other words, the third minor hypothesis was supported. TKSS and PASS-S were two instruments that measured the same construct.

The Fourth Minor Hypothesis: Criterion Validity of Self-Report

As seen at the TKSS structural model and the thesis completion latency (Appendix M), WT was not used as TKSS indicator. Model fitness with data was shown by low chi square (χ^2=5.034; DK=4; p= .284), low RMSEA (,036), and high CFI (.992). The unique contribution of WT on criterion suggested that it could be used to improve TKSS prediction power on latency of thesis completion. Nevertheless, the low factor

loading of TKSS on WT has made WT's score could not be added in the computation of KSS score.

$$KSS = \left(\frac{HK + N - KP}{3} \right)$$

By retaining WT's unique contribution and the latent variable model, a new composite score (TKS++) was formulated as a combination of KSS and WT.

$$TKSS++ = KSS - WT$$

The Fifth Minor Hypothesis: The Reliability of Observation on Sim's Behavior

The reliability of the observation results (Appendix N) suggested that most reliability indices were not good enough. However, as a whole, the duration of academic activity was still acceptable (α = .728). Therefore, the fifth minor hypothesis can be accepted. It means the duration of academic activities can be considered reliable enough, especially, when the work of four Sims' academic activities were accumulated as one single score.

The result of *The Sims 2* Game Play Scale has quite good reliability, especially on Sim's control (α = .753) and self-projection (α = .652). For academic achievement components, reliability index was not good enough (α = .533). It happened due to low correlation of the two items, PA2 and PA3 (r = .081, p>.05), and accumulation of subject response on item PA2. Thirty-three of forty-eight subjects have chosen "Setuju" (S, agree) on item PA2.

There are variations in number of participants between self-report (first until fourth hypothesis) and observation study (fifth until ninth hypothesis). There are only 48 subjects who participated in the observation study, compared to the 232 subjects who completed the self report study. These differences were due to the negligence of most of the participants to follow the observation studies. Unfortunately only 41 subjects had the required complete data. Seven subjects were eliminated from some of the analyses due to technical problems in data collection.

The Sixth Minor Hypothesis: Construct Validity of Observation on Sim's Behavior

There were three sources of evidences on observation of Sim's behavior construct validity, starting from negative correlation with latency of term paper completion (r = -.575, p< .001), positive correlation with Sim's GPA (r = .577, p< .001), and positive correlation with Sim's attitudes to academic achievements (r = .308, p < .05). Among all indicators, the highest correlation was found between the activity duration and Sim's GPA.

The latency of the term paper completion also significantly correlated with all indicators. Beside the duration of academic activity, the latency of the term paper completion also correlated with Sim's GPA (r = -.494, p < .001) and attitude to Sim's academic achievements, especially, with item PA1 ("Berprestasi di bidang akademik penting bagi *Sim* saya"; r =- .417, p< .005). It means the sooner a subject completes his/her term paper, the higher GPA his/her Sim will get, and also, the better his/her attitude to Sim's academic achievements is. It means the sixth minor hypothesis was supported.

The Seventh Minor Hypothesis: Criterion Validity of Observation on Sim's Behavior

Despite having good construct validity, observation on Sim's behavior does not have strong criterion validity. Almost no significant correlation was found between observation on Sim's behavior and both criterion (measurement result of procrastination and latency of thesis completion. Significant negative correlation was only found between the latency of term paper completion and the latency of thesis completion (r = - .351, p < .05). Second, there was a negative correlation between the subject's responses on item PA3 ("Sim saya sering membolos kuliah atau kerja sambilan") and the PASS-S score (r = - .258, p = .038). Third, negative correlation was found between the subject's response on item PA3 and the score PASS-S2 (r = - .249, p = .044). All these weak correlations indicate the low level of criterion validity. Overall, the observations of Sim's behaviors were not related to the procrastination measurement or the latency of thesis completion.

The Eighth Minor Hypothesis: Construct Validity of Multi-methods Measurement

The construct validation was conducted using correlation testing between self-report and observation results of Sim's behaviors, and also correlation testing between both of them with the PASS-S score. The correlation testing was conducted for each group, that is, procrastinator (50% subjects with low TKSS score), non-procrastinator (50% subjects with high TKSS score), and their total. Results were, then, presented at Appendix O.

Construct validation produces four important information. First, on procrastinator group, self-report and observation on Sim's behaviors produced different results. Second, contradictory findings were indicators of basic value dissimilarities and defense mechanisms. Third, self-report results and PASS-S scores were statistically significantly correlated. Fourth, Sim's checklist and PASS-S measured two different constructs.

The inference that the self-report (TKS) and the observation on Sim's behaviors measured two different constructs has two logical consequences. First, self-report measurement could not be replaced with the observations of Sim's behavior. Second, self-report results and Sim's behaviors were two different predictors on regression analysis.

The Ninth Minor Hypothesis: Criterion Validity of Multi-methods Measurement

Correlation testing between the TKSS score and the latency of thesis completion produced statistically significantly negative correlations (Appendix P). On correlation testing involving all subjects (n = 41), the produced correlation was as large as r = - .516 (p < .001). This finding highlighted contradictory associations between the self-report results and the latency of thesis completion.

Criterion validation produces four important information. First, the self-report results and the PASS-S score were statistically significantly correlated. Second, the observations of Sim's behaviors were not correlated with the latency of the thesis completion. Third, compared to the PASS-S score, the self-report results correlated more with the latency of the thesis completion. Fourth, the latency of the thesis completion in the real world negatively correlated with the latency of term paper completion in *The Sims 2* world.

Observation on Sim's behavior were statistically significantly correlated with the latency of Sim's term paper completion (r = - .351, p = .017), but not statistically significantly correlated with the PASS-S score. As a result, the used criterion for hierarchical regression analysis was only latency of the thesis completion. The predictor was added in the regression analysis using enter method. Missing data was replaced by the means. The results of hierarchical regression analysis was presented in Appendix Q. (Results of the hierarchical regression analysis are available from the author upon request.)

Linear regression analysis produced two important results. First, the best solitary predictor is TKS++ score. Second, addition of latency of Sim's term paper completion was not a statistically significant prediction on criterion.

Prediction power of TKS++ on the latency of the thesis completion could still be enhanced by addition of subject's scores on *The Sims 2*, especially on Sim's control (PS) component. Addition of predictor could elevate multiple correlation score from .543 to .643 (Appendix R).

Discussion

Empirical Framework of Multi-method Measurement on Procrastination

In this section, all the research results were summarized into one conclusion. All attentions focused on the association pattern between constructs, whether as standardized instruments (PASS-S), new instruments (self-report and observation of Sim's behavior), or latency of the thesis completion. All information was presented in Figure 1.

Self-report Result and Criterion

On total subject group, self-report results and PASS-S score were negatively correlated (r = - .600, p < .001, n = 48). Self-report results of the total subjects group also negatively correlated with the latency of the thesis completion (r = - .516, p < .001; n = 41). Higher scores accompanied higher scores on the PASS-S and the lower level of the latency of the thesis completion.

The PASS-S Results and the Latency of Thesis Completion

The procrastination measurement with the standardized instrument positively correlated with latency of thesis writing completion (r = .348, p = .013; n = 41). The higher level of thesis writing procrastination was accompanied by the higher level of latency of thesis completion (longer completion). The positive correlation was still founded on observation on non-procrastinator group (r = .307, p = .077; n = 21), or the procrastinator group (r = .066, p = .397; n = 18).

Non-procrastinator Group

On non-procrastinator group, self-report results did not correlate with the observation on Sim's behaviors. These results were found for duration (r = .003, p = .494; n = 21) and latency (r = - .277, p = .112; n = 21) of Sim's academic behavior. It means observations on Sim's behaviors did not reflect the players' daily

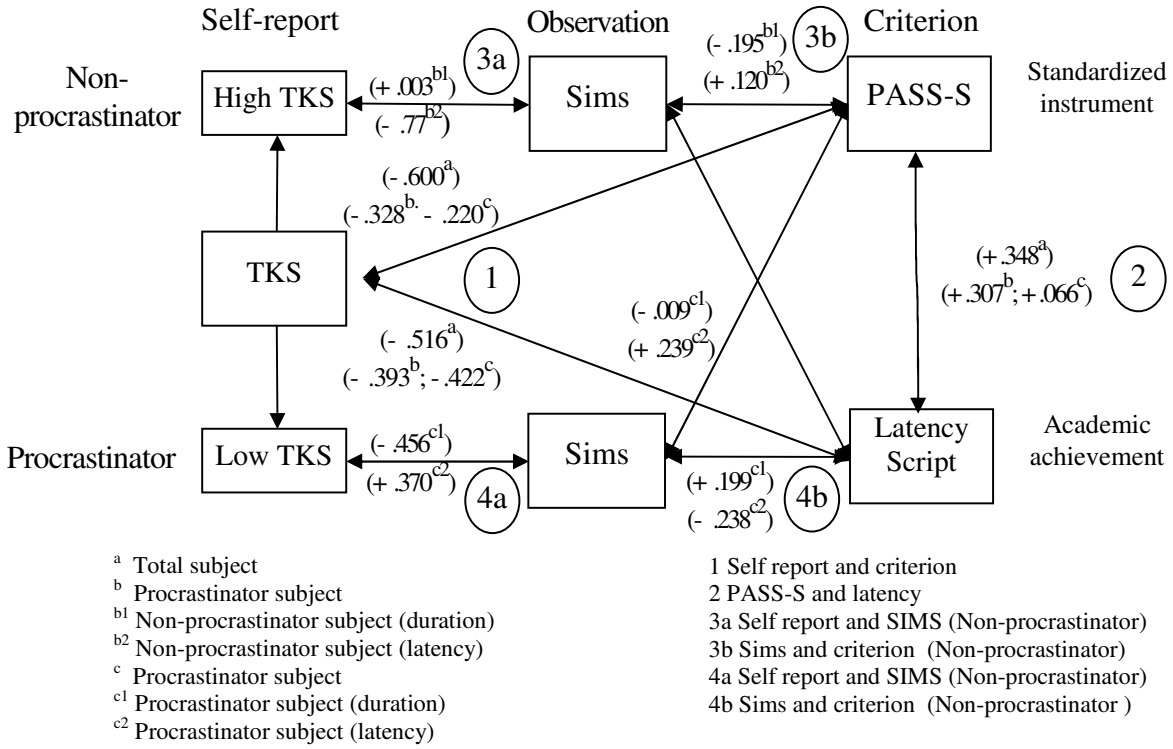

Figure 1. Empirical framework of procrastination measurement

behaviors. On the other hand, Sim's behaviors were perceived as exploration and experimentation.

Observation of Sim's behaviors did not correlate with criterion. The duration of academic activity (r = -0.195, p = .199; n = 21) and the latency of Sim's term paper completion (r = .120, p = .303; n = 21) were not correlated with PASS-S score. Another duration of academic activity (r = - .198, p = .202; n = 21) and the latency of Sim's term paper completion (r = - .119, p = .308; n = 21) were not correlated with the latency of thesis completion.

Procrastinator Group

In this group, self-report results were not correlated with the duration of the academic activity (r=-0.456, p=0.019; n=21) and the latency of Sim's term paper completion and latency (r=0.370, p=0.049; n=21). Subjective utility of thesis writing was in the opposite direction towards subjective utility of Sim's academic activity. Subjects who were less appreciative towards thesis writing were the ones who appreciate academic activities in *The Sims 2* world.

The reversal of the behavior between the real world and *The Sims 2* world on the procrastinator groups indicated two important things. First, Sim's behaviors did not reflect players' daily behaviors. Second, the reversal of behavior between the real world and *The Sims 2* world were perceived as defense mechanism.

The observation of Sim's behaviors and the latency of the thesis completion were not statistically signify-cantly correlated. The duration of Sim's academic activities (r = .199, p = .222; n = 17) and the latency of Sim's term paper completion (r = - .238, p = .79; n = 17) did not correlate with the latency of the thesis completion. The duration of Sim's academic activities (r = - .009, p = .484; n = 21) and the latency of Sim's term paper completion (r = .239, p = .148; n = 21) did not correlate also with thesis writing procrastination.

Negative Correlation Between Academic Life in the Real World and The Sims 2 World

There were three perceptions on negative correlations between academic activities in the real world and *The Sims 2* world. First, TMT approach perceived those negative correlations as indicators of contradiction of the real world and *The Sims 2* world subjective utility of academic activity. Second, Schwartz's basic value approach perceived those negative correlations as results of contradictory value structure. Thesis writing

was based on self-improvement, while Sim's academic activities were based on conservation. Third, psychoanalytic approach perceived those negative values as proofs of defense mechanisms. This insight was supported by differences in correlation patterns, found between procrastinator and non-procrastinator (Table 1).

When all the minor hypotheses results were combined with the empirical framework, it can be concluded that all of the measurements have fulfilled psychometric principles, especially internally. Self-report results were aligned with two criteria (the PASS-S and the latency of thesis completion). On the other hand, the observation of Sim's behaviors did not correlate with the criteria set.

Finally, the major hypothesis was accepted. The self-report result has fulfilled all the required psychometric principles. On the other hand, the observations of Sim's behavior were only internally valid. The observation results of Sim's behaviors were not statistically significantly correlated with the PASS-S score or the latency of the thesis completion.

Limitations

Theoretical Framework

Theoretical preposition of TMT that subjective utility was multiplicative composite of its components was not supported by the data. The interaction pattern of TMT's component is additive. Moreover, although TMT approach could suggest that negative correlation was caused by basic value dissimilarity, it could not ensure which values were involved. This limitation was compensated by the application of Schwartz's basic value and psychoanalytic approach.

Research Method

Data collection using observation of Sim's behavior was constrained by dependence on facilities (the computers, *The Sims 2* software, and the room availability). Another constraint was the length of data collection. Length duration provokes subject's refusal to participate.

The last limitation comes from the criteria set. The usage of the thesis completion as one of the criteria triggers problem in the aspect of reliability of measurement. It could not be assured that the delay of thesis completion would be repeated in the future.

Data Analysis

One of the limitations came from the distribution of scores that did not satisfy the assumption of the normal distribution. This condition has been overcome by using non-parametric data analysis techniques.

Conclusion and Suggestion

Conclusion

Self-report results have high internal reliability and internal structure that are in line with theoretical framework. The observations of Sim's behaviors also have good internal reliability. Internally, multi-method measurements have produced psychometric principles. Unfortunately, only self-report results statistically significantly correlated with criteria.

Suggestions

Theoretical background. TMT approach can explain the association between the subjective utility

Table 1. *Thesis writing procrastination and academic life in The Sims 2*

		TKS			Expectancy (HK)			Value (N)		
		I	II	T	I	II	T	I	II	T
Sim's GPA	*r*	- .004	.475	- .156	- .337	.504	- .123	.042	.125	- .239
	p	.494	.015	.162	.068	.010	.218	.428	.294	.063
	n	18	23	41	18	23	41	18	23	41
Duration	*r*	- .456	.003	- .356	- .397	- .147	- .413	- .262	.055	- .287
	p	.019	.494	.010	.037	.262	.003	.126	.406	.033
Paper	*r*	.370	- .277	.394	.709	- .046	.555	.118	- .305	.319
	p	.049	.112	.005	.000	.422	.000	.306	.089	.020
Paper I	*r*	.472	- .357	.438	.446	- .390	.370	.442	.099	.547
	p	.015	.056	.002	.021	.040	.008	.022	.335	.000

Note: I = Procrastinator II = Non-procrastinator T = Total

and the task working pattern (duration and latency). This approach could be further developed in psychological research and measurement. However, rejection on multiplicative model still needs further exploration.

Research method. Theoretical assumption about multiplicative model can only be tested in true experiment, when measurement of fourth TMT components was adjusted to the area of procrastination. Besides, it is recommended to improve the similarity of situation and condition which were being faced by each subject. All subjects should deal with the series of exactly same scenarios, to reduce effects of situational variables.

Acceleration of thesis completion. Steel (2007) suggested some advice to overcome procrastination using TMT approach. First, overcoming procrastination can be done via improving expectancies. Second, improving task value may also be the option. Third, procrastination can be conquered by reducing sensitivity to delay. Fourth, reducing time delay can be chosen as an alternative to conquer procrastination. All the advice was aimed to improve subjective utility of thesis writing, in order to reduce procrastination and thesis can be completed in time or faster.

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(*Appendix follows*)

Appendix A

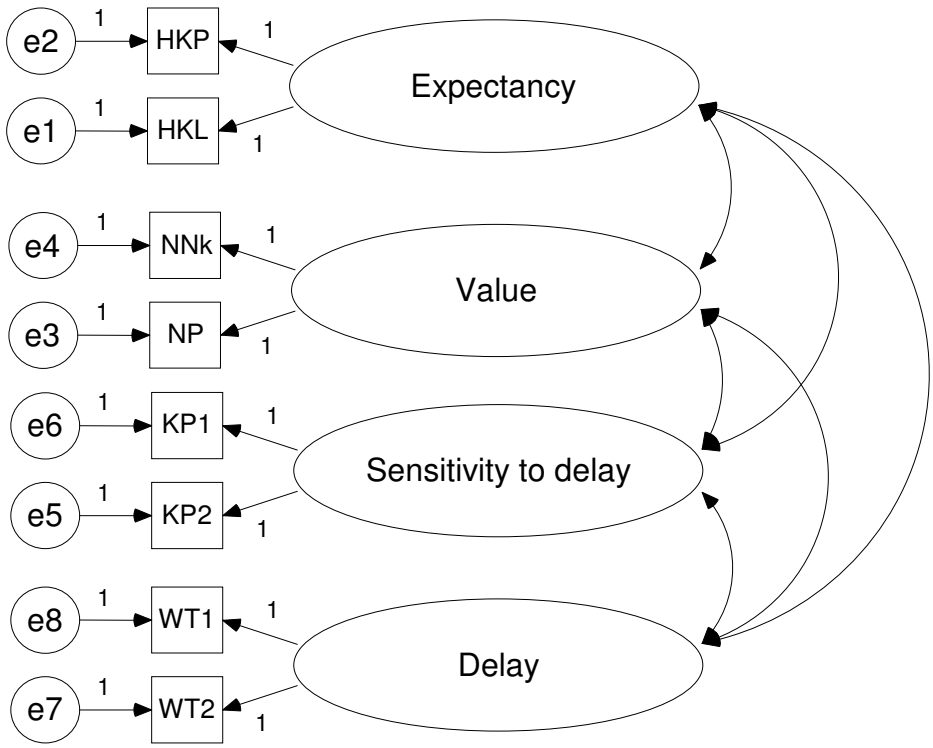
Correlation of Procrastination and TMT Components

Variable	Correlation	ρ	Confidence interval (95%)
Expectancy (HK)			
Self-efficacy	Negative	- .46*	- .42, - .34*
Value (N)			
Need for achievement	Negative	- .55*	- .40, - .31*
Sensitivity to delay (KP)			
Impulsiveness	Positive	.52*	.37, .46*
Time-delay (WT)			
Goal setting	Negative	- .23**	- **

Note.
* Steel (2007)
** Gröpel & Steel's primary study (2008), which did not report the confidence interval

Appendix B

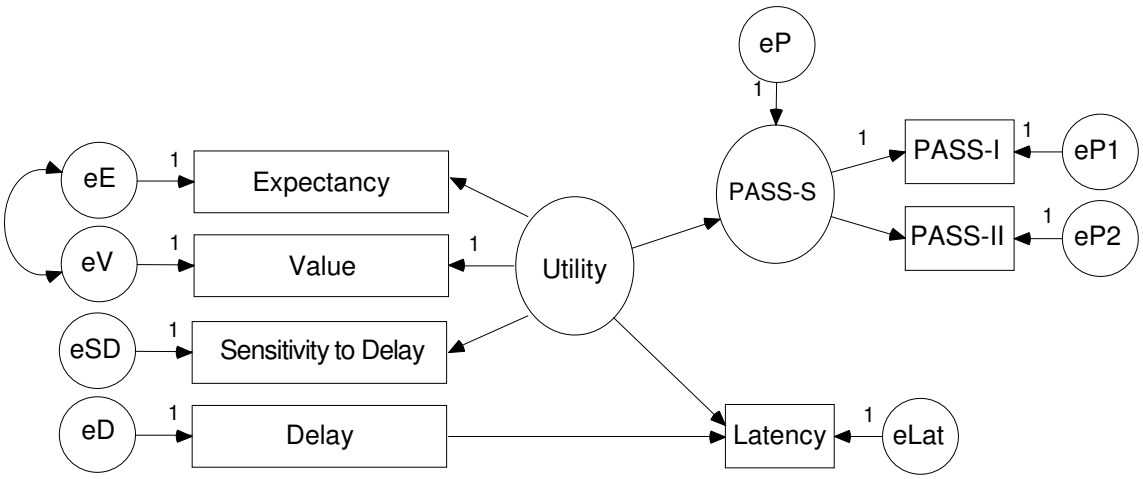
Measurement Model of Thesis Writing Procrastination



HKP : Expectancy-proposal
HKL : Expectancy-report
NNk : Value-pleasure
NP : Value-achievement
KP1 : Sensitivity to delay-prudence
KP2 : Sensitivity to delay-persistence
WT1 : Delay-1 semester
WT2 : Delay-2 semester

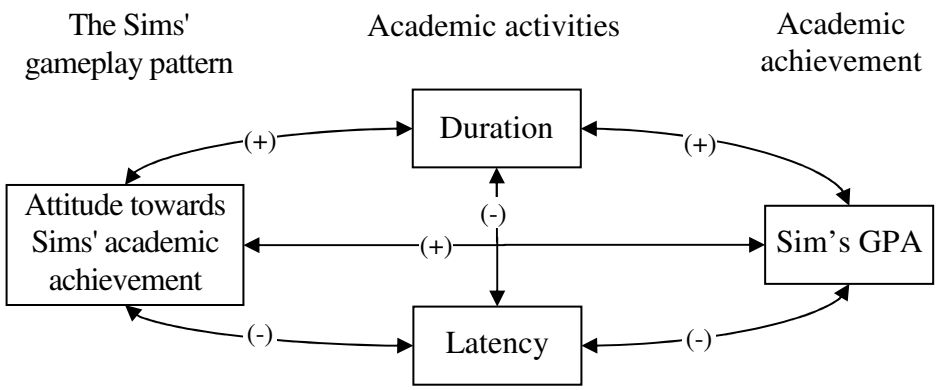
Appendix C

Structural Model of Thesis Writing Procrastination



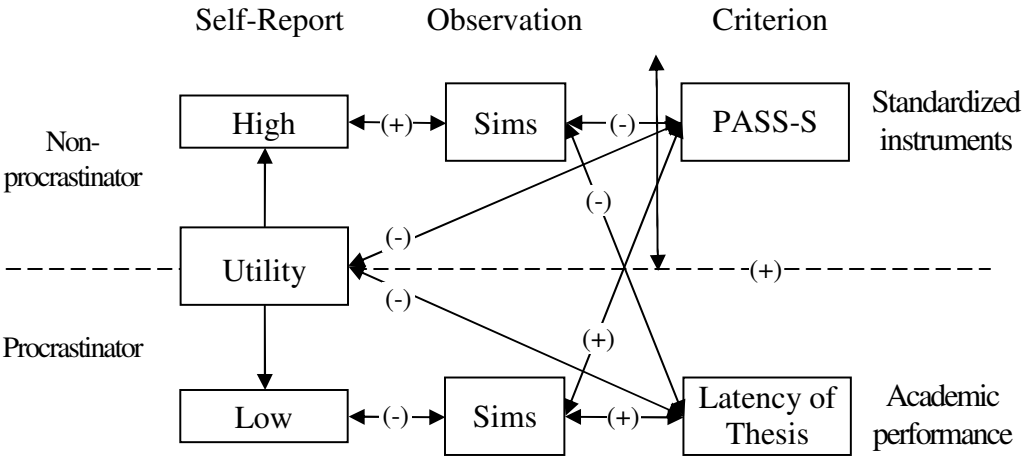
Appendix D

Conceptual Model of Academic Activities (The Sims 2)



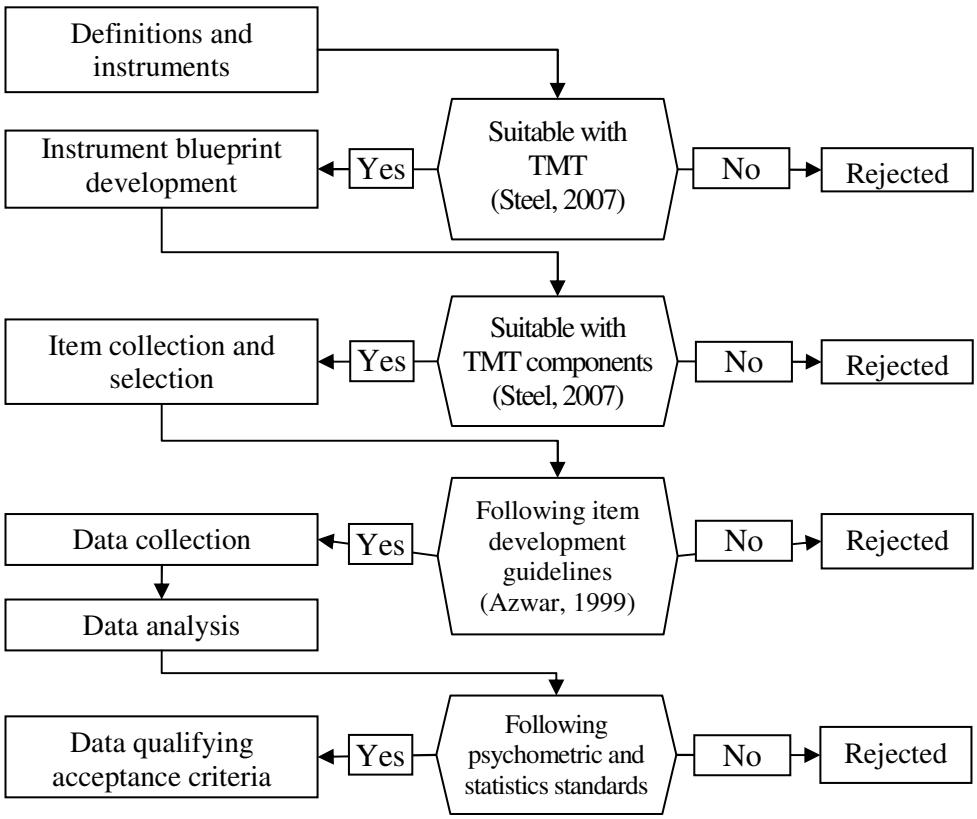
Appendix E

Conceptual Model of Thesis Writing Procrastination Measurement



Appendix F

Flowchart of Instrument Development



Appendix G

Blueprint of Thesis Subjective Utility Instrument

Measurement components (TMT notation)	Number of items
Expectancy (HK)	10
Value (N)	9
Sensitivity to delay (KtP)	9
Time Delay(WT)	2

Appendix H

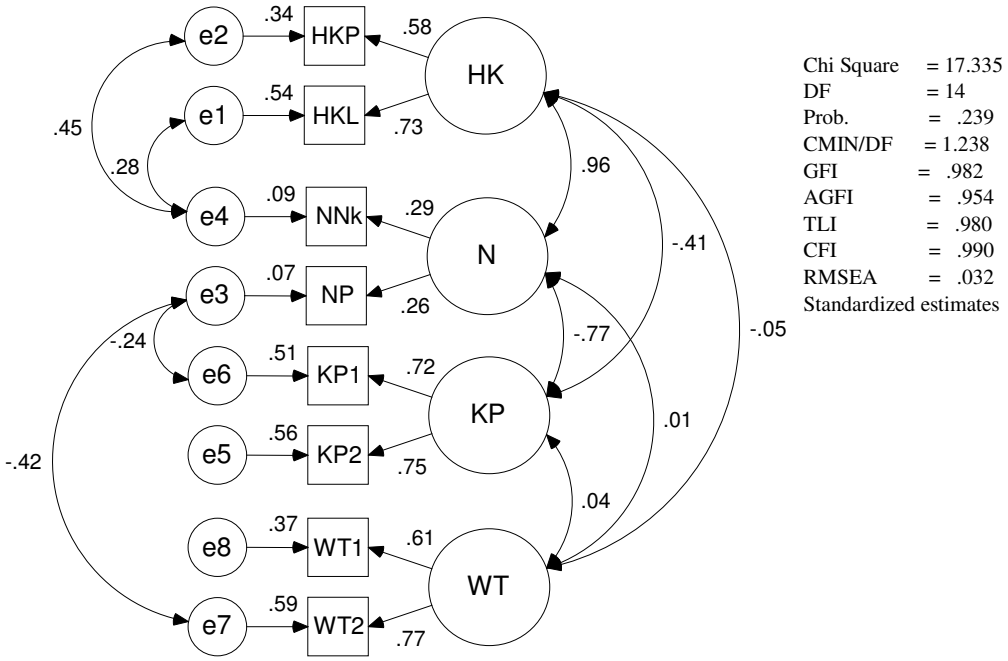
Reliability of the Measurement Results of Thesis Writing Procrastination

Instrument	Construct	Item	*Alpha*	*Sx*	*Sx* (item)	*Se*	*Se* (item)
TKS	Thesis subjective utility	30	.834	12.440	.415	5.068	.168
PASS-S1	Thesis writing procrastination intensity	12	.824	8.218	.685	3.447	.287
PASS-S2	Thesis writing procrastination reasons	26	.855	11.545	.444	4.396	.169
PASS-S	Thesis writing procrastination	38	.925	32.489	.854	8.897	.234

Note. TKSS : Thesis subjective utility

Appendix I

Measurement Model of TKSS (Partial Disaggregation)



Appendix J

Summaries of Hierarchical Linear Regression Model (PASS-S)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.471(a)	.222	.208	.889	.222	16.167	4	227	.000
2	.500(b)	.250	.216	.885	.028	1.367	6	221	.229
3	.509(c)	.259	.211	.888	.009	.681	4	217	.606
4	.514(d)	.264	.213	.887	.005	1.564	1	216	.212

Note:

a. Predictors: (Constant), D, SD, E, V

b. Predictors: (Constant), D, SD, E, V, D_x_SD, V_x_SD,V_x_D,E_x_V,E_SD,E_D

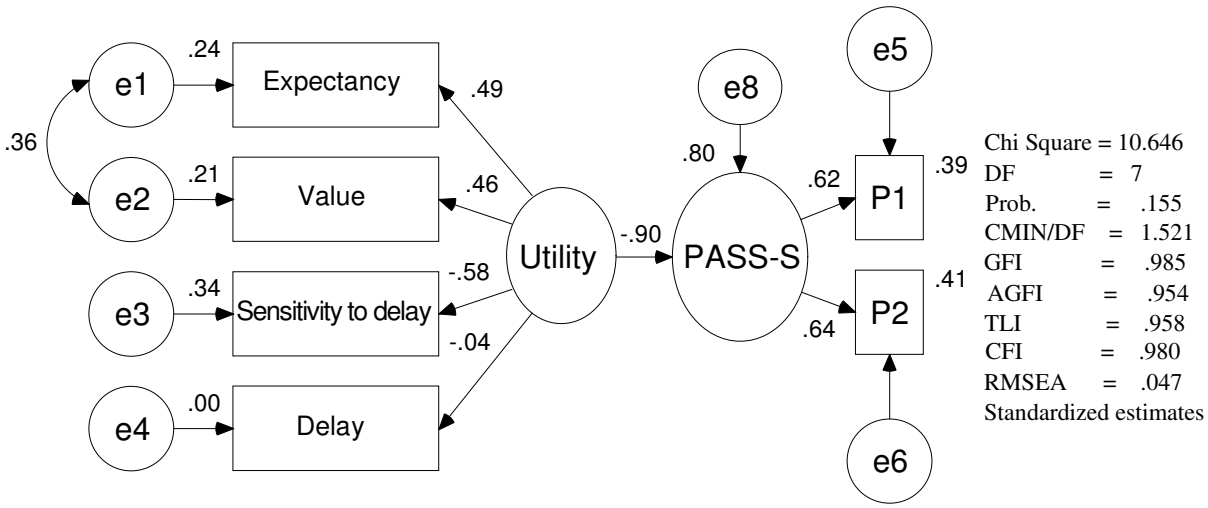
c. Predictors: (Constant), D, SD, E, V, D_x_SD, V_SD, V_D,E_x_V,E_SD,E_D,E_x_V_SD,V_SD_D,E_x_V_D,E_SD_D

d. Predictors: (Constant), D, SD, E, V, D_x_SD, V_SD, V_D,E_x_V,E_SD,E_D,E_x_V_SD,V_SD_D,E_x_V_D,E_SD_D,E_x_V_SD_D

e. Dependent Variable: PASS_lt

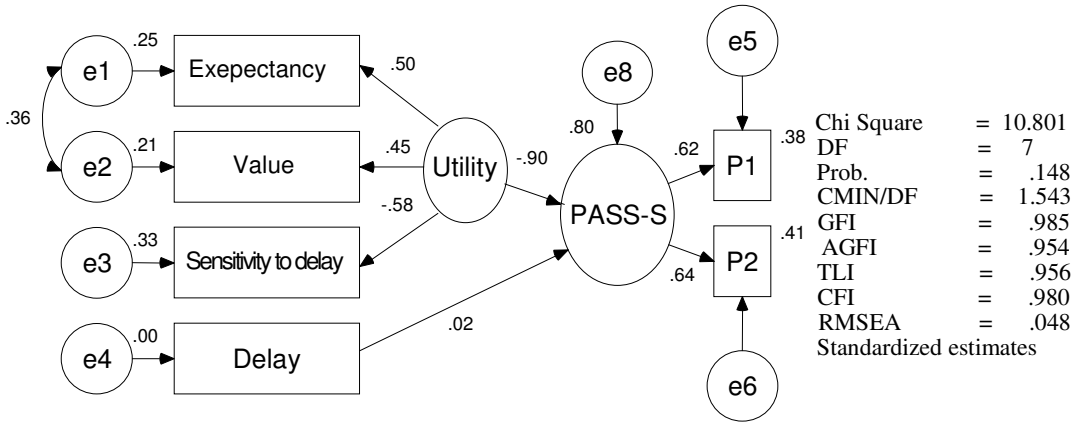
Appendix K

Structural Model of TKSS and PASS-S (Latent Variable 1)



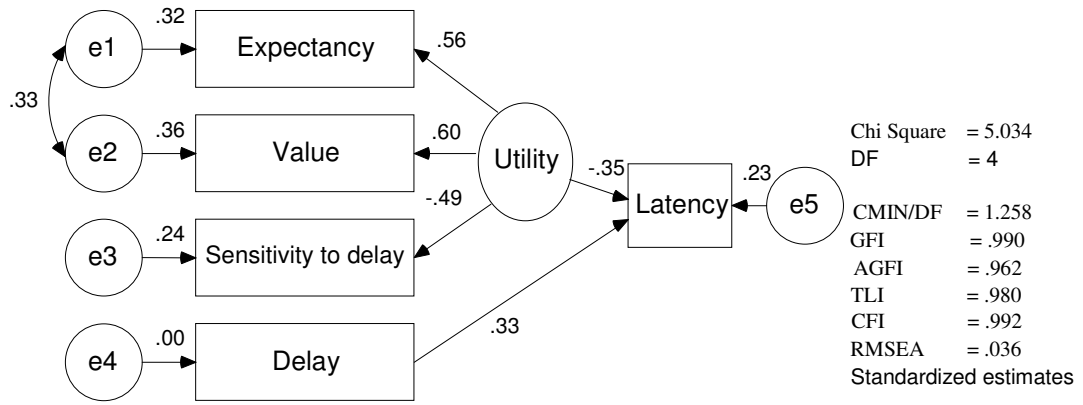
Appendix L

Structural Model of TKSS, D, and PASS-S (PASS I & II)



Appendix M

Structural Model of TKSS and Latency of Term Paper Completion



Appendix N

Reliability on Duration of Sim's Academic Activities

	Assignment	Term-paper	Class Attendance	Final Exam	Academic[a]
Duration	.488	.619	.525	.609	.728
Latency	.550	.460[b]	.541	.608	0,620

Note:
[a] Total scores on the duration of four academic activities (tasks)
[b] Using latency on the latency of of the term-paper completion

Appendix O

Construct Validity Test of Multimethod Measurement Result

		Self-Report TKSS			Sim's Behavior Observation Duration (academic)			Latency (term paper)			Standardied Instrument PASS-Script		
		I	II	T	I	II	T	I	II	T	I	II	T
TKSS	*r*		.834[a]		-0.456	0.003	-0.356	0.37	-0.277	0.394	-0.328	-0.22	-0.6
	p	.	.	.	0.019	0.494	0.01	0.049	0.112	0.005	0.059	0.151	0
	n	24	24	48	21	21	42	21	21	42	24	24	48
Academic	*r*	-0.456	0.003	-0.356		.754[b]		-0.699	-0.299	-0.575	-0.009	-0.195	0.107
	p	0.019	0.494	0.01	.	.	.	0	0.094	0	0.484	0.199	0.25
Finished	*n*	21	21	42	21	21	42	21	21	42	21	21	42
	r	0.37	-0.277	0.394	-0.699	-0.299	-0.575		.460[c]		0.239	0.12	-0.081
	p	0.049	0.112	0.005	0	0.094	0	.	.	.	0.148	0.303	0.306
	n	21	21	42	21	21	42	21	21	42	21	21	42
PASS_lt	*r*	-0.328	-0.22	-0.6	-0.009	-0.195	0.107	0.239	0.12	-0.081		.925[d]	
	p	0.059	0.151	0	0.484	0.199	0.25	0.148	0.303	0.306	.	.	.
	n	24	24	48	21	21	42	21	21	42	24	24	48

Note: Emptied box indicating statistically non-significant correlation coefficients ($p > .05$)

I Procrastinators group

II Non-procrastinators group

T Total subject (procrastinators and non-procrastinators group)

[a] Internal consistency *(Cronbach Alpha)* coefficient of TKSS measurement results (30 items)

[b] *Spearman-Brown* reliability coefficient on duration of sim's academic activities

[c] *Spearman-Brown* reliability coefficient on latency of sim's term paper completion

[d] Internal consistency *(Cronbach Alpha)* coefficient of PASS-Skripsi (38 items)

Appendix P

Criterion Related Validity Evidences of Multi-methods Measurement Results

		Self-Report TKS++			Sim's Behavior Academic			Observation Finished			Standardized Instrument PASS_lt		
		I	II	T	I	II	T	I	II	T	I	II	T
Latency	*r*	-.422	-.393	-.516	.199	-.198	.108	-.238	-.119	-.351	.066	.307	.348
Skripsi	*p*	.041	.032	.000	.222	.202	.263	.179	.308	.017	.397	.077	.013
	n	18	23	41	17	20	37	17	20	37	18	23	41

Note: Emptied box indicating statistically non-significant correlation coefficients ($p > .05$)

I Procrastinators group

II Non-procrastinators group

T Total subject (procrastinators and non-procrastinators group)

Appendix Q

Hierarchical Linear Regression Model on Thesis Completion Latency

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.496(a)	.246	.225	1.343	.246	11.445	1	35	.002
2	.516(b)	.267	.224	1.345	.020	.943	1	34	.338

Note:
(a) Predictors: (Constant), Utility
(b) Predictors: (Constant), Utility, Thesis completion

Appendix R

Hierarchical Linear Regression Model on Thesis Completion Latency [1]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.543(a)	.295	.280	1.273	.295	19.261	1	46	.000
2	.643(b)	.413	.373	1.188	.118	4.416	2	44	.018

Note:
[1] Using The Sims 2 Gameplay pattern scale scores as predictors
(a) Predictors: (Constant), Utility
(b) Predictors: (Constant), Utility, Sims Gameplay