## Running head: DOCTORAL COMPLETION TIME DYNAMICS

# Completion Time Dynamics of Doctoral Studies at Makerere University: A Hazard Model

Evaluation

Robert Wamala, Joseph Oonyu & Bruno Ocaya

Makerere University

# Author Note

Thanks to Leonard K. Atuhaire, Yeko Mwanga and Valerie Golaz for the helpful comments.

Correspondence concerning this paper should be addressed to:

Robert Wamala, School of Statistics and Applied Economics, Makerere University, Box 7062, Kampala, Uganda E-mail: <u>rwamala@isae.mak.ac.ug</u> Mobile: +256-772-623-100

### Abstract

Issues related to completion time of doctoral studies are undoubtedly an internationally challenging and important area of higher education literature. In this paper, completion time dynamics of doctoral studies were investigated based on data extracted for all 295 candidates at Makerere University in the commencement cohorts for the period 2000 to 2005. The total elapsed time, from first enrollment to submission of a final copy of a thesis, was adopted as a measure of completion time; event history (survival) analysis methodology was applied. Results reveal a median doctoral completion time of 5.0 years. Following a Cox model, in a range of candidate, candidature, discipline and institutional variables, the rate of completion was higher for candidates at the younger ages during commencement, international students, those registered in science-related disciplines and in the commencement cohorts for the period 2000 to 2002. The analysis correctly identifies the order of completion times by about 72% of the time.

Key words: Time-to-completion, Higher Degree studies, Makerere University

Student persistence in educational programs is undoubtedly one of the most studied areas in higher education literature. In Canada, UK, USA, and Australia, the concern goes way back to the 1980s (for example, Haksever & Manisali, 2000; Holdaway, 1996; Elgar, 2003; Kerlin, 1995, 1995; Lovitts & Nelson, 2000; Martin, Maclachlan and Karmel, 2001; Smith, Brownell, Simpson & Deshler, 1993; Sheridan & Pyke, 1994). Certainly, the two emerging issues at the forefront of concerns are attrition and completion time of higher degree studies, which are subject to a varying number of characteristics comprising, however not limited to: student characteristics (Tinto, 1993; Wright & Cochrane, 2000; Siegel, 2005; Vladimir, 2010), field of study (Elger, 2003;Wright & Cochrane, 2000; Martin et al, 2001), research facilities and resources (Saint John, Cabrera, Nora & Asker, 2000; Tinto, 1993), indirect help such as outside contacts (Haksever and Manisali, 2000), prior schooling (Wright & Cochrane, 2000), supervision and scholarly environment (Ginns, 2004; Harman, 2003; Neumann, 2003; Leonid & Mahsood, 2007).

Latone and Browne (2001), in a review of literature on attrition and completion time of higher degree studies affirm significant association for the variables evaluated following three major categories: 1) institutional factors (including discipline area, candidature characteristics and sense of belonging); 2) supervision arrangements (feedback, meeting frequency, relationships and early start); and, 3) candidate characteristics (entry qualifications, nature of enrolment (full-time vs. part-time), and physiological factors.

Despite an abundance of literature on higher degree studies in Europe, America and Asia, equivalent comprehensive studies are not available for African institutions. In Uganda, Mugimu, Nakabugo and Katunguka (2009) as well as Sanders, Guwatudde and Alexander (2008) provide snapshots into the "looming post-graduate crisis" at Makerere University; however, do not

present a statistical assessment of factor impacts examined in similar studies conducted in selected USA, UK, Canada and Austria's institutions. Further, Mugimu et al. (2009), in their estimation of completion rates, ignore a backlog of graduate students that are still going through the system; thus, compromising the precision of completion statistics reported. Despite the limitations, their presentation is illustrative enough in alerting us to the need for such data and its importance in determining the quality of a program and in attracting students (Gabrielle, 2001; Willging & Johnson, 2004), as well as growing the number of future academics (Wisdom, 2008).

The literature presented for universities in Europe, America and Asia, despite supporting association of completion time by candidate and candidature characteristics as well as institutional factors, may not precisely explain the situation in Africa's institutions and particularly at Makerere University. Perhaps, this has to do with differentials in academic cultures and contexts. That notwithstanding, a disparity observed regarding the choice of statistical methods and tools adopted at the univariate, bivariate and multivariate levels of analysis (for example, mean vs. median elapsed time and/or parametric vs. non-parametric methods), presents a challenge in evaluating statistical significance of associations suggested in the results. Further, there are hardly any diagnostic tests presented in quite a number of these studies to support the choice of statistical methodologies adopted in the analysis. In affirming to this, Osborne and Elaine (2002) point us to the underreporting of tests on assumptions of statistical tools which researchers rely on when drawing conclusions; thus, calling into question the validity of quite a number of results, conclusions and assertions. In any case, the findings provide important insights into information needs for evaluating such an understanding.

This paper therefore, is a result of the need to investigate, from interactionist point of view, completion time dynamics of doctoral studies at Makerere University. The high level of

student enrollment at Makerere compared to other universities in Uganda makes it an important context for pursing such an understanding in the country.

## **DATA AND METHODS**

The duration and completion of doctoral studies can be defined as a form of survival experience, where information on total elapsed time and enrollment status of a candidate (either completed or not) at the time of the survey is known. Thus, methods of event history (survival) analysis were adopted based on institutional data extracted for all 295 doctoral candidates admitted and registered across faculties and/or institutes at Makerere University during the window period 2000 to 2005. The total elapsed time, from first enrollment to submission of a final copy of a thesis, was adopted as a measure of completion time; virtually, submission of a final copy of a thesis was taken as successful completion of doctoral studies.

The analysis was completed in three stages: **1**) A descriptive summary of the duration and probability of completion, which is the survivorship function, is presented following the Kaplan-Meier (1958) estimator; **2**) Differentials in survival experiences of candidates across any two (or more) groups of potential predictors (candidate characteristics, candidature characteristics and institutional factors including field of study) were investigated and associations tested using the Log-Rank Chi-square test (Mantel, 1966; Peto, 1972); and, **3**) the Cox Proportional Hazard regression (Cox, 1972), a semi-parametric model, was adopted in examining the collective net impact of the predictors.

### **RESULTS OF THE STUDY**

The findings relate to full-time registered doctoral candidates at Makerere University with the following profile: Predominantly Ugandan by nationality (94.2%), registered on thesis-based studies (81.4%), male (76.6%), married (90.9%) and solely of Makerere University origin

for their Bachelor's and/or Master's Degrees (63.9%); as regards age at commencement of doctoral studies, a median of 37 years (ranges 24-61) was realized. Further, slightly over five in every eight candidates (63%) were in the commencement cohorts for the period 2003 to 2005.

## **Time-to-completion of Doctoral Studies**

From a complete list of 295 doctoral candidates, a total of 69 registered no load on their candidature since their first enrollment on the program, presented by a provisional admission; thus, were excluded from the analysis in the subsequent section. Such early withdrawals are considered unproblematic; as some students leave on realizing that their work will not yield acceptable standards in the discipline (Frank, 2003, p.7; National Centre for Education Statistics, 2003).

In view of the fact that the completion time of doctoral studies is not supported on the entire real line  $(0, \infty)$ , the assumed normality of the variable is unreasonable. Thus, completion time of doctoral studies, the outcome variable, was subjected to the Shapiro-Wilk test for non-normality (Shapiro and Wilk, 1965). Results of the test excluding censored observations provide evidence for the existence of certain types of "non-normality" in the data (p < 0.01); a similar test using the entire dataset (n = 224) does not show otherwise. This evidence certainly disqualifies the application of OLS following a linear regression to analyze such data, despite the fact that it can be fixed to deal with right-censoring.

Table 1 presents a descriptive summary of completion time accounting for censored observations, while Table 2 presents the Kaplan-Meier analysis based on a total of 224 candidates who were confirmed to having registered a load on their doctoral candidature at the time of the survey.

Descriptive summary of Doctoral Completion Time in months (years)

N	Min	Max	Median	Std. Error	95% CI [Median]	
					Lower	Upper
89	21 (1.8)	109 (9.1)	60 (5.0)	0.77	56 (4.7)	63 (5.3)

Table 2

## Estimated Survivorship of Doctoral Candidature

Interval [Months]	Enrolled	Completed	Not- Completed	Std. Error	$S(t)^{a}$
12 - 24	224 <sup>b</sup>	2	0	0.006	0.991
24 - 36	222	1	0	0.008	0.986
36 - 48	221	19	1	0.019	0.901
48 - 60	201	22	2	0.026	0.802
60 - 72	177	25	49	0.032	0.670
72 - 84	103	6	40	0.035	0.622
84 - 96	57	9	20	0.046	0.503
96 - 108	28	4	13	0.056	0.409
108 - 120	11	1	1	0.063	0.370
120 - 132	9	0	9	0.063	0.370

<sup>a</sup>Survivorship function of doctoral candidature

<sup>b</sup>Candidates in commencement cohorts for 2000 to 2005 who registered a load on their doctoral candidature

By November 2010, a total of 89 out of the 224 candidates who registered a load on their candidature had completed their doctoral studies; the overall completion estimate based on the total doctoral enrollment of Makerere during the period 2000 to 2005 (N = 295) came at 30.1%. According to results in Table 1, the median completion time of doctoral studies accounting for censored observations was 5.0 years, ranges 1.8 - 9.1; further, similar estimates of completion time were realized for thesis-based candidates. On the other hand, the survival experiences

presented by 12 month intervals in Table 2, points us to low completion levels of doctoral students at Makerere. For example, a four-year completion estimate, based on a total enrolment of 295 candidates was 7.5% (n = 22), while 14.9% (n = 44) denotes a five-year completion estimate of doctoral students at the University.

#### **Rate of Completion of Doctoral Studies**

The rate of completion of doctoral studies was evaluated following a Cox-PH regression; Efron method of handling ties was adopted. The variables included in the final model(s) satisfied a selection criterion – all predictors with probability value (p-value) less than 0.25 during the log-rank tests (age at commencement, sex, type of doctoral registration, nationality, financial assistantship and Broad Field of Study). Alternatively, the variables excluded from the final model(s) were marital status, change of supervision status and prior schooling (whether candidate was a graduate from within the host university or not); it is highly unlikely that the predictors will contribute anything to the final model.

The age at commencement of doctoral studies yielded better overall model fit in the general model (AIC: 816.1 versus 823.7) and thesis-based model (AIC: 720.3 versus 728.6) when evaluated using a categorical outcome. Tables 3 & 4 present results of the Cox regression for doctoral studies in general and thesis-based doctoral studies of Makerere University, respectively. The results comprise: Beta coefficients ( $\beta_x$ ), hazard ratios and respective 95% confidence interval (HR: 95% CI), standard errors of the hazard ratio (Std. Err) and significance levels following the Wald test of the null hypothesis  $H_0$ :  $\beta_x = 0$ .

Completion Rate of Doctoral Studies in general

Variable <sup>a</sup>	Coef.	HR (95% CI) <sup>b</sup>	Std. Err	р
Age				
Above 41	-	1	-	-
31-40	0.696	2.02 (1.18- 3.46)	0.544	0.011
30 and below	1.386	4.07 (2.12- 7.79)	1.342	0.000
Doctoral registration				
Research		1	•	•
Coursework and Research	-0.367	0.68 (0.30 - 1.57)	0.290	0.379
Year of enrollment				
2000-2002		1		-
2003-2005	-0.664	0.51 (0.31 - 0.83)	0.555	0.008
Nationality				
Ugandan		1	•	•
Non-Ugandan	1.069	2.95 (1.31- 6.62)	0.711	0.009
Sex				
Male		1	•	•
Female	-0.378	0.68 (0.38- 1.20)	0.253	0.188
Financial Assistantship				
No Assistance		1		
Assistance Held	-0.056	0.94 (0.56 - 1.58)	0.127	0.837
Broad Field of Study				
Science	-	1		-
Arts	-0.675	0. 51 (0.30 - 0.81)	0.127	0.007

*Note.* LR Chi2 (8) = 46.3, p < 0.001, n = 218 and AIC = 816.1

<sup>a</sup>Bold items represent reference categories adopted

<sup>b</sup>HR(95% CI) represents Hazard Ratio and their corresponding 95% Confidence Interval

Completion Rate of Thesis-based Doctoral Studies

Variable <sup>a</sup>	Coef.	HR (95% CI)	Std. Err	р
Age				
Above 41	-	1		
31-40	0.793	2.21 (1.24 - 3.93)	0.294	0.007
30 and below	1.516	4.55 (2.31 - 8.95)	0.344	0.000
Year of enrollment				
2000-2002		1		
2003-2005	-0.629	0.53 (0.32 - 0.87)	0.254	0.014
Nationality				
Ugandan		1		
Non-Ugandan	1.099	3.00 (1.23 - 7.07)	0.445	0.015
Sex				
Male		1		
Female	-0.238	0.78 (0.44 - 1.39)	0.291	0.413
Financial Assistantship				
No Assistance		1		
Assistance Held	-0.04	0.96 (0.56 - 1.61)	0.266	0.874
Broad fields of Study				
Science		1		
Arts	-0.828	0.44 (0.25 - 0.75)	0.271	0.003

*Note.* LR Chi2 (7) = 42.2, p < 0.001, n = 177 and AIC = 720.3 <sup>a</sup>Bold items represent reference categories adopted

Bolu hems represent reference categories adopt

# **Regression Diagnostics**

The following diagnostic tests were carried-out: **1**) the global and detailed test of proportional assumptions evaluated based on Schoenfeld and scaled Schoenfeld residuals support proportionality assumptions of the Cox-PH regression models presented in Tables 3 & 4 (p > 0.05); **2**) the overall model fit was evaluated using Cox-Snell residual (Cox and Snell, 1968); on

comparing the jagged line to the reference line  $(45^{0} \text{ line})$  in Figures 1, the final model(s) fit the data relatively well<sup>1</sup>; **3**) results of the specification error in Table 5 show that the Cox-PH models were well specified as predicted by hat-statistic (\_hat: p < 0.05), while results of hat-square statistic (\_hatsq) shows that no additional variables were significant (p > 0.05); **4**) the predictive power of the model(s) was evaluated using Harrell's C concordance statistics (Harell, Lee and Mark, 1982;1996); concordance measures show that by using the predictors, the Cox model correctly identifies the order of completion times for pairs of candidates by about 72% of the time, for model of doctoral studies in general(Harrell's C = 0.715, Somers' D = 0.430) and thesis-based doctoral studies (Harrell's C = 0.7171, Somers' D = 0.434); and, **5**) disproportionate influence of observation (outliers and influential cases) was determined using likelihood displacement values (Collett, 2003). A graph of likelihood displacement in Figure 2 identifies in general; removal of the subject lead to relatively large changes in the values of the log likelihood.

<sup>&</sup>lt;sup>1</sup> Mario et al. (2010) argue that, variability about the 45% line is still expected for well fitting Cox-model, particularly in the right-hand tail because of reduced effective sample caused by prior failures and censoring.



Figure 1. Cumulative hazard of Cox-Snell residuals



*Figure 2. Likelihood displacement values for model of doctoral studies in general and thesisbased doctoral studies* 

Specification Errors of Link Function

Model		Coef.	Std. Err	р
Doctoral Studies				
	_hat	0.967	0.146	0.000

_hatsq	0.135	0.033	0.349
Thesis-based Doctoral Studies			
_hat	0.903	0.172	0.000
_hatsq	0.162	0.154	0.292

## **Summary of the Findings**

In a general model of doctoral studies of Makerere University presented in Table 3, significant association with the hazard of completion was noted for the variables namely, age at commencement, field of study, nationality and year of commencement (p < 0.05). In other words:-

- The rate of completion was 4.1 times higher among candidates below 30 years and 2.0 times higher among candidates in the ages 30-40 compared to candidates above 40 year at commencement.
- Doctoral candidates enrolled in the Arts-related disciplines had a 49 percent reduced rate of completion compared to their counterparts in the Science-related disciplines (Haz.Ratio = 0.51).
- The rate of completion among international candidates was 2.95 times higher compared to the native counterparts (Haz.Ratio = 2.95)
- Doctoral candidates in the commencement cohorts for 2003 to 2005 had a 49 percentage reduced rate of completion compared to candidates enrolled in the earlier period of 2000 to 2002 (Haz.Ratio = 0.51).
- Alternatively, the rate of completion of doctoral studies of Makerere University in general did not vary significantly by financial assistantship, type of doctoral registration (research vs. coursework and research) and sex of the candidate.

Secondly, in evaluating the rate of completion of thesis-based doctoral studies at Makerere, age at commencement, field of study, nationality and year of enrollment (p < 0.05) yielded a significant association with the hazard of completion. In other words:

- The rate of completion was 4.5 times higher among candidates aged below 30 years and 2.2 times higher among candidates in the ages 30-40 compared to candidates above 40 year at commencement.
- Thesis-based candidates enrolled in Arts-related disciplines had a 56 percent reduced rate of completion compared to candidates in the Science-related disciplines (Haz.Ratio = 0.44).
- The rate of completion among international candidates was 3 times higher compared to their native thesis-based doctoral counterparts (Haz.Ratio = 3.0)
- Thesis-based doctoral candidates in the commencement cohorts for 2003 to 2005 had a 47 percentage reduced rate of completion compared to candidates in the earlier period of 2000 to 2002 (Haz.Ratio = 0.53).
- Alternatively, the rate of completion of thesis-based doctoral studies at Makerere University did not vary significantly by financial assistantship and sex of the candidate.

## DISCUSSIONS AND CONCLUSIONS

The completion time estimate of doctoral studies at Makerere (5.0 yrs: 95% CI 4.7 – 5.3) compares favorably with the maximum stipulated permissible period of doctoral candidature of staff presented in the University Human Resource Manual (Makerere University, 2009, p.53). Nevertheless, the assertion of a longer completion time of doctoral studies at Makerere compared to other local and international universities is debatable. While the completion time statistic is

significantly higher that estimates of 4.5 years in a Malaysian university (Ismail and Abiddin, 2009) and 4.4 years in one Australian university (Bourke et al., 2004), it compares favorably with an average of 5 years across Ph.D candidates in eight Australian universities (Bourke et al., 2006) and ranges of 4 to 5 years among Canadian universities (Frank, 2003). However, the dearth of documented evidence on doctoral completion time of candidates in African institutions makes comparisons impossible. Definitely, this points to the need to develop and/or refine existing data management systems in these institutions to allow for routine collection, analysis and reporting. All the same, the overall completion (30.1%) and subsequent evaluations at various point (for example, 7.5% and 14.9% four and five-year rates, respectively) confirm a low turn out of Ph.D students at the University; thus, calls for further analysis of extended candidature and attrition of doctoral studies.

Following Tinto's (1975; 1993) interactionist point of view, quite a number of associations were supported in the analysis. As regards candidate demographics, the results corroborate literature that has established differentials in completion time by age at commencement of doctoral studies (for example, Bourke, Holbrook & Lovat, 2004; Martin et al, 2001) and nationality (Bourke et al, 2004; Sheridan & Pyke, 1994; Wright & Cochrane, 2000). However, the findings run counter to literature that has established differentials in completion time of doctoral studies by gender (for example, Council of Graduate School, 2008; D'Andrea, 2002; Siegel, 2005), marital status, prior schooling(Wright & Cochrane, 2000) and type of doctoral registration (Smith, 1993). Unlike research by Bourke et al. (2004) and Martin et al. (2001) that identified timely completers among candidates at older ages, timely completers at Makerere were noted among doctoral candidates at the younger ages of commencement. It is no surprise that Mugimu et al. (2009), in their study of graduate students at Makerere University,

suggested, among many other factors, family and work-related obstacles hindering timely completion; such obstacles are more likely among adult learners (Ely, 1997). In 2005, Lovitts argues that adult learners are oftentimes ill-prepared to deal with the challenges graduate studies poses to them. As regards to nationality, the consensus is that, timely completers are noted among international doctoral candidates.

In the same vein, the results add to literature that has identified field of study as a predictor for completion time of doctoral studies (Bourke et al., 2004; Martin et al., 2001; Mugimu et al., 2009; Wright & Cochrane, 2000; Vladimir, 2010). The consensus is that, a shorter completion time of doctoral studies is noted among candidates registered in science-related disciplines. In an attempt to provide explanation for the discipline differential in completion time of higher degree studies at Makerere, following the student perspective approach, Mugimu et al. (2009) point us to academic isolation of students and staff particularly in the arts-based disciplines. Perhaps, this is due to the high enrollments of students in the Art disciplines compared to the sciences; thus, resulting in a heavy teaching, supervisory and administrative workload. The fact that art-based candidates had a reduced rate of completion confirms suggestions of a more backlog of students in the discipline purported by Mugimu et al. (2009).

The hypothesis of timely completion of doctoral studies of candidates with financial assistantship<sup>2</sup> was not supported (p > 0.05). In other words, the findings run counter to research that has identified timely completers to be doctoral candidates with financial assistance (Ismail & Abiddin, 2009; Mugimu et al, 2009; Saint John, 2000; Tinto, 1993; Valentine, 1997). Of

<sup>&</sup>lt;sup>2</sup> The vast majority of candidates with financial assistantship are staff at the University. The assistance was sources mainly from the following organizations: SIDA/SAREC, BTC, DAAD, NUFU, DANIDA and University staff development funds.

particular importance is research by Mugimu et al. (2009), following the student perspective, that identified financial assistantship as a key influencing factor for and/or against timely completion of graduate studies at Makerere University. However, the results adopting the institutional perspective did not provide statistical evidence to support the hypothesis; nevertheless, the later results adopting the institutional perspective would be more ideal.

Worth mentioning is the reduced rate of completion of doctoral candidates in the commencement cohorts for the period 2003 to 2005 compared to their counterparts during earlier years. The findings support assertions of an increase in completion time of doctoral studies at Makerere University "in the recent years". In a review of graduate students' perceptions of support needed for timely completion of their studies at Makerere University, supervisory and administrative related requirements were ranked highest (Mugimu et al., 2009). Particularly, the administrative support requirements comprised, however not limited to, timely approval of viva and student's work, maintaining proper records and establishing students' support committees.

Though a number of associations with doctoral completion time were supported in the results, the contextual issues and net-effect of the predictors may vary between countries and institutions. Nevertheless, the dynamics of doctoral completion time at Makerere is not an isolated problem of higher degree studies, but relates favorably with experiences reported among international universities. However, variations in significance of associations could be a result of methodological differences in methods and tools adopted.

#### REFERENCES

Bourke, S., Holbrook, A. & Lovat, T. (2004). Attrition, Completion and Completion Time of Ph.D Candidates. *The AARE Annual Conference*, Adelaide, Australia.

- Bourke, S., Holbrook, A. & Lovat, T. (2006). Relationships of PhD candidate, candidature and examination characteristics with thesis outcomes. *The AARE Annual Conference,* Adelaide, Australia.
- Cox, D. R. & Oakes, D. (1984). Analysis of Survival Data. London: Chapman and Hall.
- D'Andrea, L. M. (2002). Obstacles to completion of the doctoral degree in colleges of education. *Educational Research Quarterly*.
- Ely, E. E. (1997). *The non-traditional student*. American Association of Community Colleges Annual Conference. Anaheim, CA, April 12-15. (JC970516)
- Frank, J. Elgar (2003). *PhD Degree Completion in Canadian Universities. Final Report.*Halifax, Nova Scotia: Graduate Students Association of Canada. Retrieved from <a href="http://http-server.carleton.ca/~felgar/phdcompletion.pdf">http://http-server.carleton.ca/~felgar/phdcompletion.pdf</a>
- Harman, G. (2003). PhD student satisfaction with course experience and supervision in two Australian research-intensive universities. *Prometheus*, 21(3), 317-333.
- Haksever, A. M. & Manisali, E. (2000). Assessing supervision requirements of PhD students: The case of construction management and engineering in the UK. *European Journal of Engineering Education.*
- Ismail, A. & Abidin, N. Z. (2009). Service attributes of Graduate Research Students' needs in a Malaysian University. *The Journal of International Social Research*, 2(6), 1-2
- Latona, K. & Browne, M. (2001). Factors Associated with Completion of Research Higher Degrees. *Higher Education Series, Report No.37*, May, Higher Education Division, Department of Education, Training and Youth Affairs, Canberra.
- Leonid Grebennikov & Mahsood Shah (2007). Enhancing the Research student Experience at University, University of Western Sydney. *Australasian Association for Institutional Research Forum*. Retrieved from http://www.aair.org.au/app/webroot/media/pdf/AAIR%20Fora/Forum2008/
- Lovitts, B. E. & Nelson, C. (2000). The Hidden Crisis in Graduate Education: Attrition from PhD Programs. *Academe*, 86(6), 44-50.

- Martin, Y. M., Maclachlan, M. & Karmel, T. (2001). *Postgraduate Completion Rates*. Occasional Paper Series, Higher Education Division, DETYA (now DEST), Canberra.
- Makerere University (2009). *Human Resource Manual* (pp.53). Retrieved from http://intranet.mak.ac.ug
- Mantel, N. (1966). "Evaluation of survival data and two new rank order statistics arising in its consideration." *Cancer Chemotherapy Reports*, 50 (3), 163-70.
- Mario, Cleves, Roberto G. Gutierrez, William Gould & Yulia, V. Marchenko (2010). *An introduction to Survival Analysis Using Stata* (3<sup>rd</sup> ed). StataCorp LP
- Mugimu Christopher B., Nakabugo Mary G. and Katunguka R. Eli (2009). Exploring Factors affecting Staff Research output and Completion Rates of Graduate Students in Makerere University. *Unpub. Report*
- Saint John, E., Cabrera, A., Nora, A. & Asker, E. (2000). Economic influences on persistence reconsidered: How can finance research inform the reconceptualization of persistence models.
- Sanders, D., Guwatudde, D. & Alexander, L. (2008). Accessible public-health education: a potential growth area. *Bull World Health Organization*. 86(8), PMID: 0042-9686
- Smith, S. W., Brownell, M. T., Simpson, R.L. & Deshler, D.D. (1993). Successfully Completing the Dissertation: Two Reflections on the Process. *Remedial and Special Education*, 14(3), 53-60.
- Tinto, V. (1993). Leaving College: Rethinking the causes and cures of student attrition. (2<sup>nd</sup> ed.). Chicago: *University of Chicago Press*.
- Vladimir Jiranek (2010). Potential Predictors of Timely Completion among Dissertation Research Students at an Australian Faculty of Sciences. *International Journal of Doctoral Studies*.
- Wisdom Tetty (2008). Comparative Analysis of Next Generation of Academics Indicators. *The University Leaders' Forum*. Accra, Ghana
- Wright, T., & Cochrane, R. (2000). Factors influencing successful submission of PhD Theses. *Studies in Higher Education*, 25, 181-195.