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Development of an Online Knowledge Base for Secondary Schools:

A case of Muchinga Secondary in Isoka District, Zambia

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ABSTRACT

Zambia is on the right side of the international digital divide, as it has made the most significant effort to integrate Information and Communications Technologies (ICT) into the school curriculum. The diffusion of computers, Wi-Fi and Internet connectivity in some schools, and the increase in the usage of mobile smart phones and social media by school managers, teachers and pupils, is an opening for inducing Knowledge Management in schools. Secondary schools require an electronic Knowledge Base system, i.e. a Knowledge Management system that is able to present educational information, data and knowledge, needed by the learners. The system development will facilitate knowledge sharing, creation, transfer and searching activities optimally on any device with a standard browser, anytime and where there is internet connectivity. The purpose of this research is to design an effective online knowledge base for secondary schools. This study examines "how a knowledge base can used to support teachers in their pedagogical practice to aid leaners in knowledge search and access anywhere and anytime?" The Online Knowledge Base development requires the active participation of the Community of Practices (CoPs) in secondary schools, to share and search knowledge that can be utilized for academic excellence. In this case study, the developed "SchoolPagesZM Knowledge Base" a web based system prototype was used for the study at a rural secondary school in Isoka district. The contribution of this research to the field will be in the development of design principles that can be applied to knowledge management system development and implementation in schools. The Findings may help provide insights for the development of assessment tools for Knowledge Management implementation initiatives and practice in secondary schools.

Keywords: *Knowledge Management, Knowledge Base, Secondary School, Online System*

1.0 INTRODUCTION

The purpose of this research is to design an effective online knowledge base for secondary schools. This study will examine "how a knowledge base can be developed considering the available mobile devices teachers and learners own, current KM initiatives, knowledge search methods, knowledge documents needed, using the prototype, to support teachers in their pedagogical practice and to aid leaners in knowledge search, access, anywhere and anytime as well as on any device that has a standard browser?"

Online Knowledge Base development requires the active participation of the Community of Practices (CoPs) in secondary schools, to share and search knowledge that can be utilized for academic excellence. In this case study, the developed "School Pages ZM Knowledge Base" a web based online system was used. The system comprises of the Knowledge Search, Common Q and As, My Class (Learning Management System), and Teachers' forum, Downloads and Blog pages. The Testing of the prototype is conducted by teachers, HODs and students as key stakeholders at Muchinga Secondary. The link for this research study is: http://schoolpageszm.000webhostapp.com

Knowledge sharing can be facilitated through Information and Communications Technologies that include, smart phones, computers, search engines, emails, Video-conferencing, Skype, social media apps, information systems, office productivity tools and many more. However, appropriate tools to store, access, distribute and to use knowledge resources in schools are still in their infancy and in most cases non-existence. Searching information and knowledge about examinations, teaching and learning materials is required to provide the best academic practices valuable to stakeholders in secondary schools, in order to improve performance and competitiveness.

Schools, like most organizations, should learn and gain knowledge so as to improve decision making and innovation especially in the age of increased external and internal pressures for change and improvement. Increased external and internal pressures for change and improvement in the Ministry of General Education in Zambia, such as the establishment of an EMIS system to train school mangers in methods of how to make use the technology and the demands for teachers to have a professional responsibility to ensure that own their skills and knowledge are regularly updated [8], [5], KM can be used as a strategy by schools to improve competitive performance. Zhao (2010) in [3], points out that school KM can facilitate acquisition, sharing and application of teacher knowledge in school so as to

better manage and apply schools' tangible and intangible knowledge assets, especially the professional knowledge, experiences and competencies of teachers

In schools, there is evidence of some KM initiatives that involve sharing, transfer, and creation and storage of Knowledge. Mostly, lesson study in schools is practiced as a Non-ICT KM approach, a part of School Program of In-service for the Term (SPRINT). In these program successful teachers share excellent subject knowledge and great skills in planning, preparing and providing effective learning experiences [8]. I claim that ICTs such as social media (Facebook, WhatsApp, and Twitter etc.), emails, wikis, and some Open Source Knowledge base systems can be used to engage teachers in professional learning and to spice the already existing efforts in KM initiatives in schools that can easily contribute to learner performance due to availability of Knowledge search and access sources.

There are two basic approaches to Knowledge Management for which technologies can provide support: codification and personalization according to Hansen et al, [2]. With the codification approach, more explicit and structured knowledge is codified and stored in knowledge bases. The main role of Information Technology here is to help people share knowledge through common storage so as to achieve economic reuse of knowledge. An example of such Information Technology tools is electronic knowledge repositories. With the personalization approach, more tacit and unstructured knowledge is shared largely through direct personal communication. The main role of Information Technology here is to help people locate each other and communicate so as to achieve complex knowledge transfer. In this paper, the Information Technology tool in question is the online based knowledge base "SchoolPagesZM Knowledge Base".

This paper adopts case study methodology to explore how Knowledge Management can be utilised and sustained in secondary schools for the development of an online knowledge base that can be accessed at anytime, anyplace with internet connectivity and on any device with a standard web browser. In this case study, a Knowledge base system called "SchoolPagesZM Knowledge Base" a web based system was developed to serve as the infrastructure for knowledge sharing.

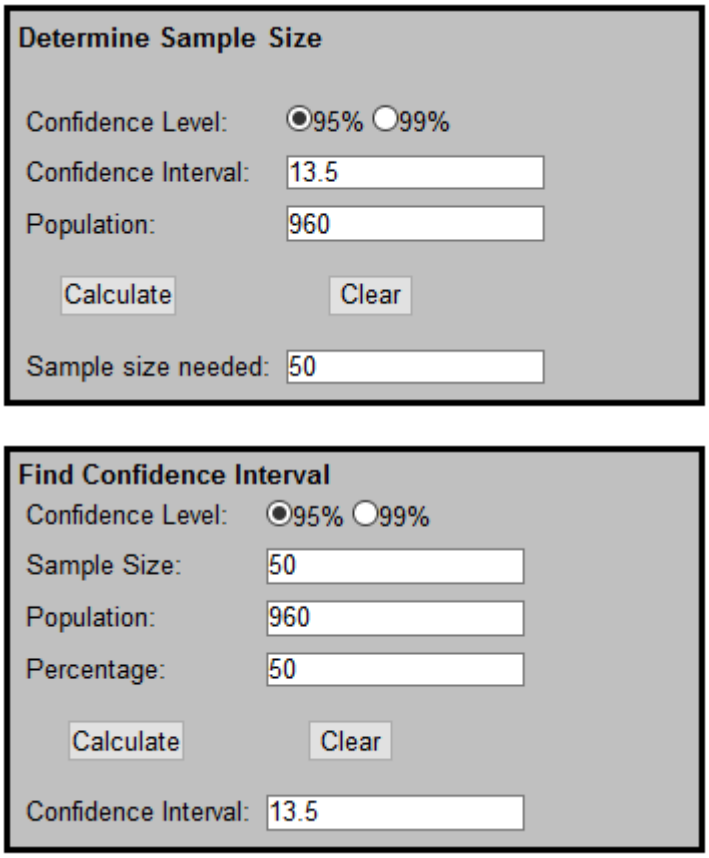
The contribution of this research to the field will be in the development of design principles that can be applied to knowledge base system design and development in secondary schools. The Findings may help provide insights for the development of the assessment tool for basic technologies and information systems resources

for Knowledge Management initiatives and practice in a school set up in Zambia. The paper hopes to make contributions for Knowledge Management (KM) implementation in the education sector within secondary schools in Zambia. However, most experts in the field of education agreed that, when properly used, information and communication technology hold great promise to improve teaching and learning in addition to shaping workforce opportunities [1].

2.0 RESEARCH DESIGN AND METHODOLOGY

The population in this study consisted of Muchinga secondary school students and staff in Isoka district. According to the school Headteacher (2017) there is an average of 55 students in each class and each grade stream from grade 8s to 10s has four classes each and total school staffing of about 58 teachers. Using www.surveysystems.com [7] sample formula and calculator, 50 respondents were provided with questionnaires. The sample size from 960 school population estimates was determined with the 95% confidence level and confidence interval level of 13.5 as shown in **figure 1.0**

Figure 1.0 Sample size calculator interface



Data sources from questionnaires and interviews, have been collected for evaluation using Microsoft Excel package. The questionnaire contained following sections: 1) Device information, 2) Current KM initiatives 3) Learners Knowledge search methods, 4) content for Knowledge Base system and 5) Knowledge base system pages. After questionnaire distribution, respondents were exposed to the prototype Knowledge base, because this paper also, implements case study methodology to explore how KM can be utilised and sustained. In this case study only, a KM system called "SchoolPagesZM Knowledge Base" a web based system was developed to serve as the infrastructure for knowledge management system study. The link for the prototype used in this case study for academic research purpose only was: http://schoolpageszm.000webhostapp.com

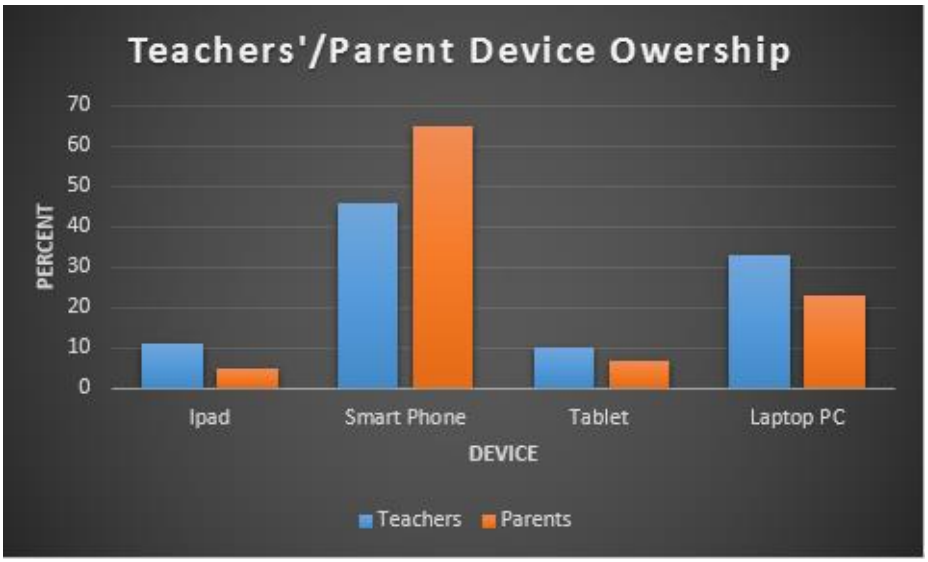
3.0 RESULTS AND DISCUSSION

The knowledge base system development characteristics considered in the survey includes, device ownership information, Knowledge management initiatives in practice, Knowledge search methods, Knowledge documents to search, pages for the knowledge base system and teachers' pedagogical practices for knowledge base development.

3.1 Device Ownership

From **figure 2.0** below, majority of teachers and parents' respondents own smart phones than iPads, tablets and laptop PCs. Parents device ownership information was from learners who were sampled in the survey and that they are allowed at home to use such electronic gadgets.

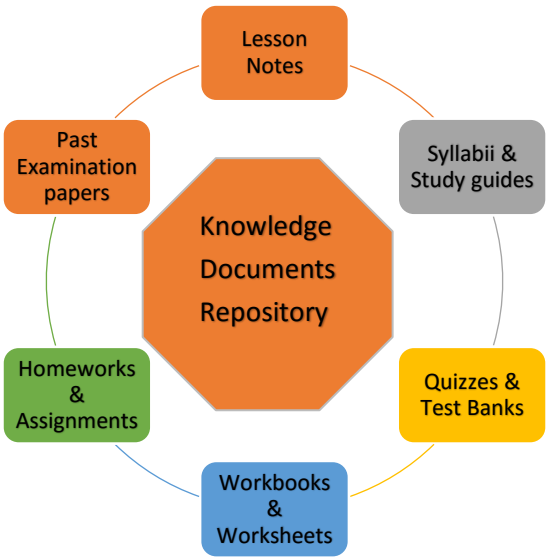
Figure 2.0 Parents and Teachers' Device Ownership



3.2 Knowledge Management Initiatives in Practice

The Chart in **figure 3.0** below, shows categories of documents that are under hard and soft copy Knowledge management initiatives that are in practice and stored in various school repositories, and facilities.

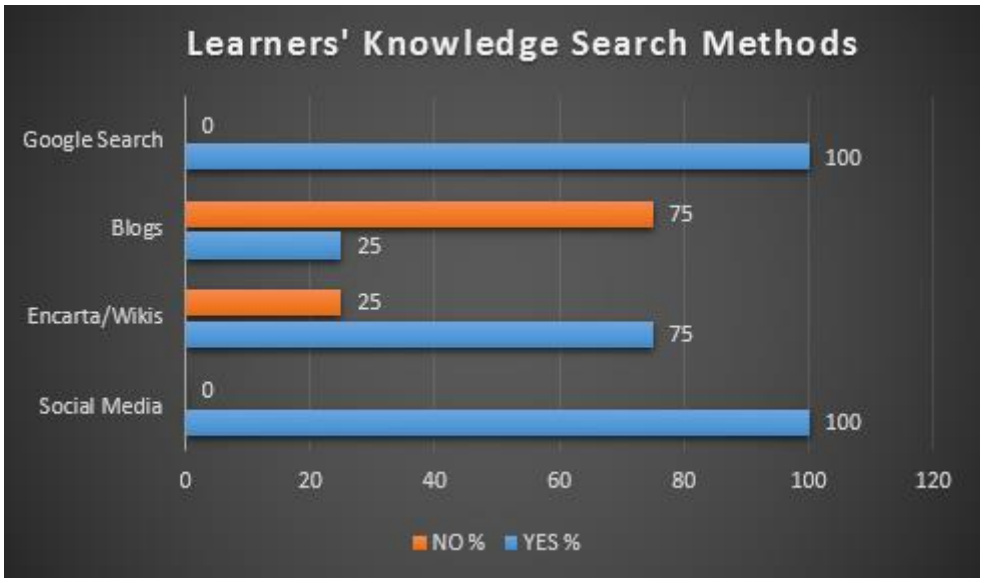
Figure 3.0 Knowledge Management initiatives and Documents repositories



3.3 Knowledge search methods

From **figure 4.0**, Majority of the learners use Google search (100% said Yes) and social media (100% said Yes) (Mainly Facebook and WhatsApp) as the means of knowledge search on the internet, to Knowledge bases (computer base Encarta and online wikis) were identified in the second place (75% said Yes) while Blogs are not popular for Knowledge search (75% said No).

Figure 4.0 Learners' Knowledge Search Methods



3.4 Knowledge Search Documents Frequency Rating

Table 1.0 Analysis of responses to the statement: 'I suggest the following Knowledge documents to be stored and updated for Knowledge search on SchoolPagesZM Knowledge Base'

Knowledge Documents	Scale strongly Agree #5	Agree #4	Neutral #3	Disagree #2	Strongly Disagree #1	Weighted Mean	Deviation
1.Lesson Notes	31(32%)	10(20%)	3(6%)	2(4%)	4(8%)	**14.1333**	**10.86278049**
2.Test/Quiz Banks	25(50%)	19(38%)	0(00%)	2(4%)	4(8%)	**13.9333**	**10.05982107**
3.Past Exam Questions	40(80%)	5(20%)	1(2%)	1(2%)	1(2%)	**15.0667**	**15.2787434**
4.Extra-Curricular Resources	12(24%)	36(72%)	0(00%)	0(00%)	2(4%)	**13.7333**	**13.74045123**
5.Work books/Work sheets	14(28%)	27(54%)	4(8%)	2(4%)	3(6%)	**13.1333**	**9.5289034**
6.Home work	41(82%)	3(6%)	0(00%)	3(6%)	3(6%)	**15.0667**	**15.54348738**
7.Syllabi / Study Guides	40(80%)	7(14%)	1(2%)	1(2%)	1(2%)	**15.6**	**15.17893277**
8.Assignments	13(26%)	19(38%)	2(4%)	7(14%)	9(18%)	**11.3333**	**5.727128425**

From the **table 1.0** above, Majority of the respondents strongly agreed to include; lesson notes (32%) mean of 14.1 and SD 10.8, Test/Quiz banks (50%) mean of 13.9 and SD 10.0, past examination question papers (80%) mean of 15.0 and SD 15.2, Home work (82%) mean of 15.0 and SD 15.0, and syllabi/study guides (80%) mean of 15.6 and SD 15.1 as the Five knowledge documents as the must on the knowledge base system development.

Table 1.0, shows extra-curricular resources (72%) mean of 13.7 and SD 13.7, workbook/worksheets (54%) mean of 13.1 and SD 9.5, and Assignment (38%) mean of 11.3and SD 5.7, were the three Knowledge documents which respondents agreed to include in the knowledge base system development.

The average percentage of the respondents in the neutral, disagree and neutral scale is about 4.6% negligible for consideration in the knowledge base system development.

3.5 Knowledge Base System Modules Frequency

Figure 5.0 Knowledge Base Prototype Interface

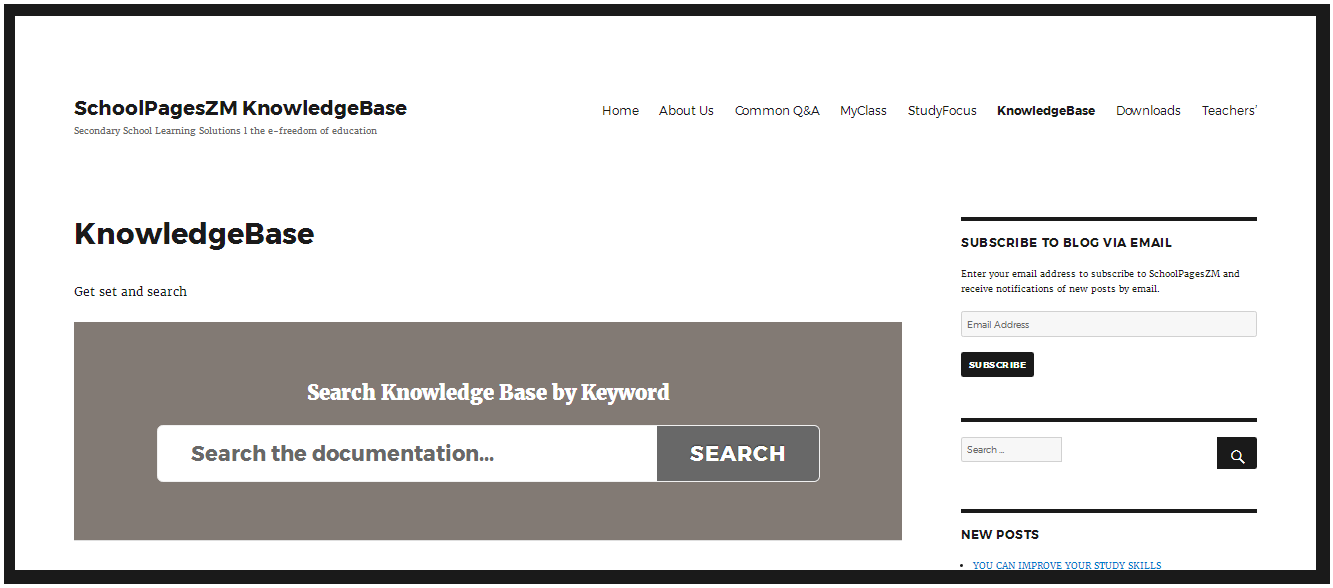


Table 2.0 Analysis of responses to the statement: 'I recommend the following Modules (Pages) as appropriate for Knowledge base content on SchoolPagesZM Knowledge Base'

Scale	Agree #4	Neutral #3 Disagree #2	Deviation

Modules (Pages)	strongly Agree #5				Strongly Disagree #1	Weighted Mean	
1.Home Page [Blog]	10(20%)	38(76%)	0(00%)	2(4%)	0(00%)	13.7333	14.47756886
2.Knowledge Base	23(46%)	13(26%)	4(8%)	6(12%)	4(8%)	13	7.293833012
3.Common Q&A [FAQs}	17(34%)	22(44%)	1(2%)	4(8%)	6(12%)	12.6667	8.074651695
4.Study Focus	11(22%)	12(24%)	11(22%)	5(10%)	0(00%)	9.73333	4.621688003
5.Downloads	37(74%)	9(18%)	2(4%)	1(2%)	1(2%)	15.3333	13.82750881
6.My Classes	20(40%)	26(52%)	4(8%)	2(4%)	3(6%)	14.8667	10

From the **table 2.0** above, Majority of the respondents strongly agreed frequenting; Knowledge base (46%) mean of 13.0 and SD 7.2, and Downloads (74%) mean of 15.3 and SD 13.8, modules on the prototype knowledge base system. Respondents agreed frequenting; homepage (76%) mean of 13.7 and SD14.4, Frequently Asked Questions (44%) mean of 12.6 and SD 8.0, study focus (24%) mean of 9.7 and SD 4.6, and my classes (52%), a learning management system module, with mean of 14.8 and SD 10.0.

The average percentage in the neutral, disagree and neutral scales is about 13.6% frequency which is negligible for consideration in the knowledge base system development.

3.6 Practices for Knowledge Base System Management

Table 3.0 Analysis of responses to the statement: 'I recommend the following Practices to be recorded and stored for teachers' Knowledge search on SchoolPagesZM Knowledge Base teachers' forum page'

Scale / Practices	Strongly Agree #5	Agree #4	Neutral #3	Disagree #2	Strongly Disagree #1	Weighted Mean	Deviation
1.Teaching Methods	4(40%)	3(30%)	2(20%)	1(10%)	0(00%)	2.66667	1.414213562
2.Best Practices	5(50%)	3(30%)	1(10%)	1(10%)	0(00%)	2.8	1.788854382
3.Experiences	2(20%)	3(30%)	4(40%)	0(00%)	1(10%)	2.33333	1.414213562
4.Skills	6(60%)	3(30%)	1(10%)	0(00%)	0(00%)	3	2.28035085

From the **table 3.0** above, Majority of the respondents strongly recommended of; teaching method (40%) with a mean of 2.6 and SD 1.4, best practices (50%) mean of 2.8 and SD 1.7, and skills (60%) mean of 3.0 and SD 2.2 as key practices to manage the knowledge base system. 30% of the respondents recommended experiences with the mean of 2.3 and SD 1.4.

The average percentage in the neutral, disagree and neutral scales is about 10% frequency, negligible for consideration in the knowledge base system development and system administration on the teachers' forum module integrated on the prototype.

4.0 CONCLUSION

This study proposed an online knowledge base system development and "SchoolpagesZM knowledge base" prototype for secondary schools. The month-long survey conducted in at Muchinga secondary school in Isoka, Zambia revealed that "SchoolpagesZM knowledge base" and knowledge search, sharing, and storage are effective and practical in terms of schools' knowledge base development. Benefits include the externalizing and combining of knowledge, determining the objectives of knowledge sharing, combining knowledge documents and practices to search knowledge, and promoting teacher-learner interaction in knowledge search. What is needed now for the knowledge base system development is a good collection of digitized educational materials which can be up-loaded or stored in cloud or local servers for the learners to search.

From this case study, 1) teachers and parents own smart phones than other mobile devices; 2) knowledge management initiative are in practice and the school store hard and soft copies in document repositories; 3) knowledge search methods on the internet used by most learners are Google search, social media and knowledge bases such as Encarta(computer based systems) and wikis(online based systems); 4)Respondents agreed to include lesson notes, tests/quiz banks, past papers, home works, syllabi/study guides in the knowledge base system development; 5) Respondents frequented the Knowledge base, downloads than the home page, Frequently Asked Questions (FAQs), study guides and my classes a Learning Management System (LMS) ; 6).Teachers recommended teaching methods, best practices and skills for knowledge base system development and management.

From this study, it can be revealed that the knowledge base prototype users agreed that knowledge base online system can be an addition source of Knowledge to the already existing efforts in secondary

schools. According to Olivera [6], those technology systems serve a variety of functions such as storing large amounts of information, making information accessible to individuals, providing means of communication, generating records of interactions and transactions, and automating processes. The development of such a system offers the advantages of time saving, quality improvement, practical knowledge made applicable, replication, consistency, ability to update knowledge, learning tools, cost savings and productivity, according to Abdullah et al, [4]. The school through CoPs and lesson study activities should plan to sensitize the teachers and learners on the utilisation of the Knowledge base system.

A future study on a larger scale that examines multiple secondary schools is recommended to supplement this case study. These initial findings and the experience of "SchoolpagesZM knowledge base" system may serve as a valuable reference for knowledge base system development in secondary schools. This will help schools with a limited workforce and limited funding encourage their members to actively and effectively conduct knowledge search, transfer, innovation, and sharing.

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