Applying a Knowledge Evaluation Framework in the Nigerian Public Sector

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Abstract: Effective knowledge management requires available, complete knowledge that can be readily accessed when undertaking organisational processes and functions. In most organisations in developing countries, knowledge is frequently paper-based, however, there is increasing digital provision. The Nigerian public sector aims to use Information Technology to manage digital knowledge and, in doing so, improve organisational performance. To streamline digitalisation, existing knowledge used by staff in fulfilment of their duties could be digitised. Before digitising, we created an approach to assess existing knowledge, a five-stage Knowledge Evaluation Framework. This used task decomposition to identify and assess knowledge use in task fulfilment, with interviews, task walkthroughs and observation used to gather task data. The framework merged established approaches including Hierarchical Task Analysis, Skills-Rules-Knowledge Framework and Swimming Lane Sequence Diagrams to diagrammatically represent knowledge use in tasks. Using these diagrams, knowledge walkthroughs assessed knowledge availability, completeness and correctness in the Nigerian public sector reviewing the documents identified as the knowledge sources. The final stage, outcome assessment, focuses on the typical results of task fulfilment reviewing historical data from completed activities. The Knowledge Evaluation Framework was successfully applied in the Nigerian Public Sector, with tasks decomposed and knowledge tasks, actors and sources identified. Staff believed that knowledge was available and of high quality, however, contrary to these expectations in the knowledge walkthroughs we found that knowledge was often missing, obsolete or incorrect. Further, we found that whilst tasks may be knowledge-based, typically staff in the Nigerian public sector used their own, implicit "Guess Knowledge" rather than accessing organisational knowledge. The outcome assessment highlighted that there were significant problems with inappropriate, often guess knowledge use resulting in project delays and increased costs. Use of the Knowledge Evaluation Framework enabled us to explore existing knowledge provision and in doing so, to identify that there are significant knowledge gaps requiring knowledge creation. In addition, we identified that cultural change is needed, with knowledge valued and used rather than largely ignored. These findings have significant implications for the future design of a knowledge management system and highlight the potential of this method to explore knowledge use in an organisation.

Keywords: Knowledge Management, Nigerian Public Sector, Knowledge Evaluation Framework, Guess Knowledge

1. Introduction

Knowledge Management is fundamentally geared towards increasing productivity and improving internal efficiency and effectiveness of business processes enabling organisational development and sustainability. However, although knowledge is one of the most critical organisational resources, it is often not fully utilised in leveraging organisational objectives (Torabi and El-Den, 2017). To ensure that employees' use and leverage knowledge it needs both to be available and correct, enabling employees to effectively complete their tasks in the organisation. However, there are few approaches that enable the measurement of completeness and correctness of organisational knowledge (Wiig, 2009), providing a major research agenda for researchers and practitioners.

The Nigerian Public Sector is a tripartite organisation with a similar system of administration and management, between and across departments and ministries, with all ministries similarly structured and performing similar functions based on state policies. The Nigerian public sector has been criticised for being ineffective and inefficient. Contributory factors include corruption (Nwanolue and Chidubem 2012), organisational structure (Esu and Inyang 2009) and culture (Ekeke 2011) and limited resources and management foresight (Onuorah and Ebimobowei 2012). However, an alternative reason for inefficiency and ineffectiveness is that knowledge is not being accessed nor used appropriately (Ekeke, 2011). Nigerian public sector knowledge is typically hard copy (Ekeke, 2011; Acheampong, 2014), however, government policy aims for a digital knowledge-based civil service (Eneh, 2011). Our work focuses on supporting this digitisation, with our start point to explore and assess existing knowledge for assimilation.

Measuring knowledge correctness and its direct impact on organizational performance is a key concern for organizational success. Knowledge is an intangible strategic asset, yet measuring it is a challenge (Bharadwaj et al. 2015). Shannak (2009) highlighted that there are few methods for measuring knowledge (e.g. Skandia Navigator, European Foundation for Quality Management), particularly where this is hard copy. Additionally, many knowledge management approaches, tools and techniques are IT driven and/or are targeted at organisations in developed countries. These approaches have potential for implementation of knowledge management, however, firstly our goal was to identify and assess the knowledge that would be incorporated.

Both tacit and explicit knowledge are critical to organisations (Oguz and Sengun, 2011). Tacit knowledge is action-oriented based on practice, acquired by personal experience and expressed through human actions, attitudes, competencies, experiences and skills. It resides in the mind of individual and is difficult to share (Iftikhar, Steven and Adnan, 2010), express, capture or codify (Nonaka and Takeuchi, 1995). Explicit knowledge is knowledge that can be articulated in formal language and is specific, organised, stored, communicated and shared between individuals in organisations (Girard, 2006) typically based on known organisation processes, routines and procedures which can easily be codified, shared and reused (Wang, Su, and Yang 2010). In exploring knowledge in the Nigerian public sector we aimed to identify the use of both tacit and explicit knowledge and the interactions between them.

However, whilst exploring knowledge in the Nigerian public sector an unanticipated finding quickly emerged, of employees using what we have termed "Guess" knowledge. Rather than accessing organisational knowledge, individuals instead made a best guess based on previous experience. This is significantly different to tacit knowledge, it is not based on personal competence or expertise, instead it is a best guess without any attempt to underpin the guess with explicit knowledge. Guess knowledge can be the result of limited knowledge availability, for example, with information hiding or hoarding requiring that an individual has to guess. Similarly, it can be a response to poor quality knowledge resources, with knowledge available but incomplete or incorrect. Guess knowledge was so widespread in the Nigerian public sector that we used it as a category within our analysis. As discussed in this paper, Guess knowledge can become common practice with serious consequences for an organisation's effectiveness.

2. Knowledge evaluation framework

To explore knowledge in the Nigerian public sector we developed a five stage Knowledge Evaluation Framework (KEF) for use with operational processes, that is tasks performed in an organisation with an expected end and quantifiable outputs, see figure 1.

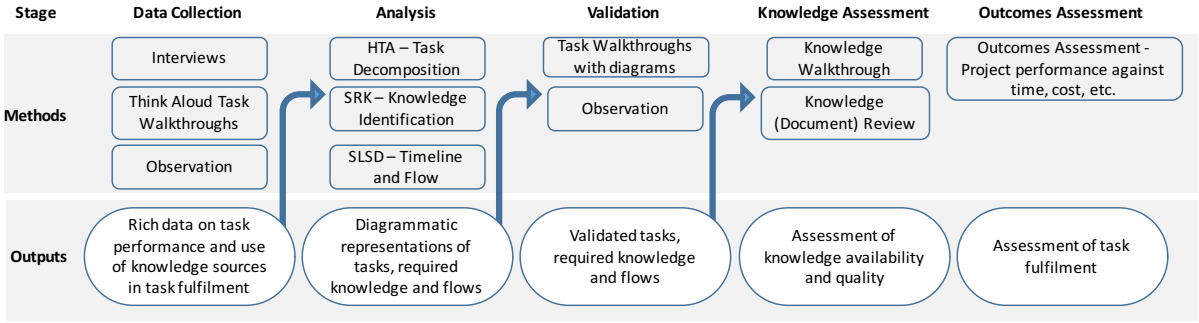


Figure 1: Knowledge Evaluation Framework

2.1 Data collection

Semi-structured interviews, task walkthroughs with think-aloud and observation in the workplace provided a flexible and systematic manner to collect relevant data in relation to the selected tasks.

2.2 Analysis

To understand and analyse the operational processes we applied Hierarchical Task Analysis (HTA) a top-down approach (Annett, 2004) that decomposes tasks into a hierarchy of goals and operations (Stanton and Young, 1999), see figure 2. HTA is a structured approach that begins with the main task defined through intended goals and then decomposed into smaller component tasks with associate processes. Ormerod and Shepherd (2004) highlight the need to capture both the human factors (knowledge and workload) and the operational

process of the task performed. HTA was selected as it is a flexible, extensive and systematic approach for identifying weakness and behaviours that usually occur during task analysis (Phipps, Meakin and Beatty, 2011). The HTA is a well-established tool for task analysis, however, with our focus on knowledge we needed to explicitly identify required knowledge.

Exploring knowledge in tasks was achieved through the concept of the Skills-Rule-Knowledge (SRK) framework by Rasmussen and Nielsen (2011) that was adopted for the design and implementation of the HTA. The SRK framework is grounded on human performance of a given task classified into one or more of three levels: skill, rule and knowledge-based drawn upon during task performance. The SRK strength is based on the ability to break down main tasks into various levels of task processes and goals (Phipps, Meakin and Beatty, 2011) along with the knowledge to support these. The goals and processes of each subtask are aimed at providing understanding of the main task goal and process through accessing and applying relevant knowledge. Our aim using of SRK was to make visible the knowledge within tasks performed during task walkthroughs.

Swimming Lane Sequence Diagrams (SLSD) (Rummler and Branche (1995) were used to structure the procedural and knowledge based tasks. SLSDs provide a cross-functional approach that frames business processes efficiently and effectively (Jeyaraj and Sauter, 2014). SLSD depicts the interaction within a process and the sequence (Millham and Yang, 2004). Incorporating SLSD provides the opportunity to analyse and understand how activities and responsibilities are shared between various actors who are fulfilling the tasks and enabled us to identify knowledge-based tasks mapped to knowledge location/format and owner.

The SLSD follows horizontal and vertical columns which depict various actors, tasks and the activities within the task consistent with (Rumbaugh, Hamood and Griswold 1999; Jeyaraj and Sauter, 2014). The swimming lanes streamline and organise task by purpose, with arrows are used to show the flow of information and activity between each main and sub-task activity.

2.3 Validation

The diagrammatic output provides a visualisation of knowledge use, with all knowledge (embedded and explicit) identified through the task decomposition. This output is validated by staffs who undertake the tasks, ensuring that the tasks are appropriately decomposed and required knowledge identified.

2.4 Knowledge assessment

Using the validated structures, the required knowledge is given a first pass assessment. This is achieved through undertaking a Knowledge Walkthrough; an approach we have developed based on Task Walkthrough but focusing on those tasks that involve knowledge. The identified knowledge is reviewed against the task to assess whether it supports fulfilment. Although there are many ways to measure knowledge quality, our criteria were straightforward: 1) Was the knowledge available; and 2) Did it support task fulfilment.

2.5 Outcomes assessment

To assess whether knowledge was adequately supporting task fulfilment we reviewed task outcomes by considering historical data of previously fulfilled tasks. This enable us to assess whether tasks were fulfilled in a timely manner and whether the projects or interventions that had resulted through tasks being fulfilled were on time, in budget, met citizen expectations and contractor obligations, such as payment.

3. Illustrative study - method

The KEF was used to explore four major functions: Ministerial Tendering, Purchase Requisition, Payment Process and Budgeting tasks. These were chosen because they involve common tasks performed by all Ministries, Departments and Agencies within the public sector in Nigeria. With the constraints of this paper, we illustrate use of the Knowledge Evaluation Framework through its application to a specific Ministerial Tendering subtask, Award Contract. This operational process is common across and central to most key government business processes. The end result or desired outcome of this task is to award a contract that can provide a service on behalf of the Nigerian government to the people. Ministerial tendering involves the application of significant knowledge as it requires accountability as well as checks and balances from the perspective of services rendered to the government and services rendered on behalf of government.

3.1 Stage 1: data collection

9 Delta State Ministry Directors of Planning, Research, and Statistics who had served in the public service for over twenty years and were educated to university degree level participated. The selection of personnel was based on their experience and knowledge of job functions with each Director having worked their way through the ranks in the Nigerian Public Sector, with the authority and ability to respond to questions. Each Director participated in two 2-hour individual sessions in their office, firstly an interview and secondly a Task Walkthrough.

3.1.1 Interview

The session began with a briefing on the objective of the study (to explore knowledge use for its assimilation into an online system) and of information confidentiality (a key issue for participants). Participants were asked to briefly describe their background and the tasks they usually performed, including the responsibilities of their department and the ministry represented. This aimed to capture participants' knowledge of the tasks to be discussed. The discussion engaged participants on their understanding of the work flow and duties of the ministry they represented, as well as discussion of the most common tasks and those which would be part of the second session. The information from the interviews informed the structure and discussion within the Task Walkthrough session.

3.1.2 Task walkthrough & observation

In session 2, participants were asked to identify the high level tasks that frequently occurred in their ministry. The participants then walked through frequently occurring high level tasks, identifying how the task was initiated and undertaken, the task actors, resources and flows, inputs and outputs, and duration. The participants then performed the task, explaining their activities with data collected using task walkthroughs and observations of participants engaging in tasks. Timelines were constructed providing approximate durations for task fulfilment.

3.2 Stage 2: analysis

The qualitative data from the task walkthroughs with the 9 participants was analysed immediately after the session, tasks were decomposed and represented as HTA diagrams. To illustrate our analysis approach, here we use the specific subtask of Award Contract within the task of Ministerial Tendering. As detailed in figure 2, the task was decomposed, using Hierarchical Task Analysis informed through the discussion from the interviews, task walkthroughs and observations.

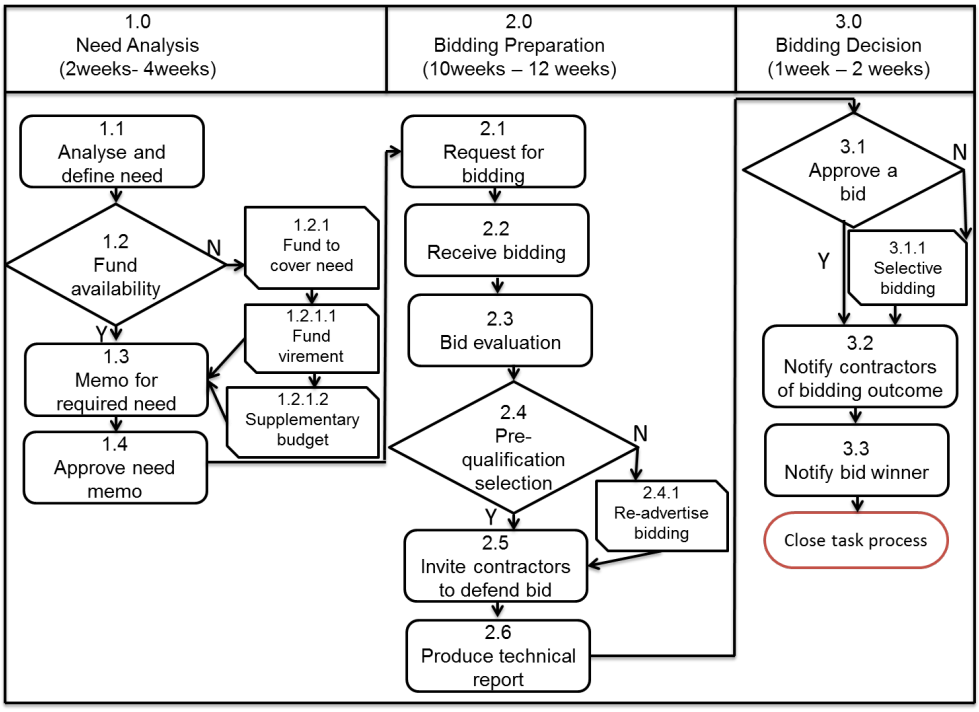
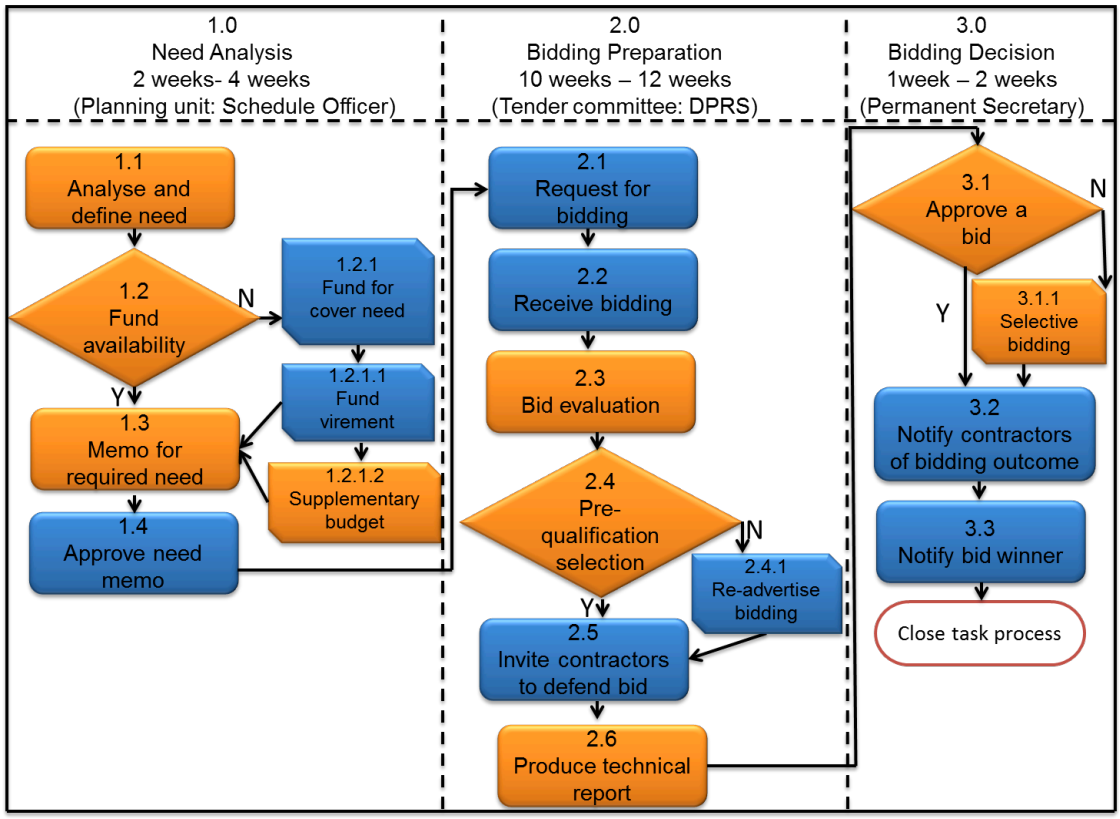


Figure 2: HTA showing processes within a Contract Award task

The HTA is then refined to identify where knowledge is required within task fulfilment applying SRK. SRK was used to identify knowledge areas and contribution to tasks, reflecting the way processes were carried out. Although not detailed in figure 3 for reasons of clarity, each sub-task was also mapped to unit and department for both task fulfilment and where units are acting as knowledge sources.
Using the HTA and SRK, the SLSD begins with categorising the main tasks from the HTA (e.g. Need Analysis) and their associate sub-tasks into units separated by dotted lines as swimming lanes. This categorisation defines whether tasks are prescriptive and procedural, or whether they require knowledge use for fulfilment. As in any process, many sub-tasks are procedural, for example in the Bidding Preparation task, sub-tasks 2.1, 2.2 and 2.5 are procedural and prescriptive processes not requiring decisions involving knowledge application, whereas, tasks 2.3, 2.4 and 2.6 require the Vetting Committee members to have the capability (knowledge) to review the bids. Focusing on the knowledge tasks, the types of knowledge applied during task processes were identified, these included: Analytical, Costing, Financial Management, Technical, Secretarial and Project Management.



Key
Orange colour: Knowledge area
Blue colour: Procedure area

Figure 3: Award Contract task with knowledge, tasks and sources

3.3 Stage 3: validation

As visible in the figure above, tasks were decomposed using knowledge gained from the interviews and Task Walkthroughs and analysed and visualised using HTA, SRK and SLSD. The Knowledge Evaluation Framework enables us to identify knowledge-based tasks and to map the task to the knowledge location, format and owner. Participants were asked to review and refine the task structures to validate their appropriateness. During the validation each participant performed task specifications using the visualised task structure. When this had been validated, participants were also asked to provide approximate estimates for task completion, informing the SLSD and enabling us to establish approximate forecasts for task completion.

3.4 Stage 4: knowledge assessment

To assess the knowledge quality, using the diagrams, mapping and notes, we undertook knowledge walkthroughs, checking that the knowledge identified to support knowledge tasks was firstly available, and secondly correct. Where clarification was required, those staff who were engaged in performing the tasks in Award Contract were observed whilst undertaking tasks and/or interviewed in relation to task fulfilment.

3.5 Stage 5: outcome assessment

The expected outcome of the Award Contract task is that a contract is awarded. In the assessment of the outcomes of this task, a random sample of 40 completed projects were reviewed to identify whether this task had been fulfilled within the expected timeline (as detailed by participants) and whether any errors had been made in the Award Contract phase.

4. Illustrative study - results

Existing knowledge and its use by staff in achieving organisational objectives and functions was explored across all 9 ministries. The findings from our illustrative task are representative of most other tasks
During the interviews, participants stated that they used and applied the correct knowledge and that knowledge sources for the tasks were available and correct. During Task Walkthroughs participants identified the knowledge needed for tasks and where this knowledge was located. During the knowledge walkthrough, this knowledge was then assessed on two criteria: 1) Was the knowledge available; and 2) did it adequately support task fulfilment (correct and complete).
In the knowledge walkthrough with related document review, all of the 9 knowledge tasks in Award Contract failed to meet both knowledge quality criteria, often with significant impacts as highlighted in table 1.

Table 1: Indicative results using the task Award Contract.

Task	Knowledge: Missing, Incorrect or Guess	Impacts
1.1 Analyse and define need	Obsolete analytical and costing models Guess knowledge used to define project deliverables	Projects poorly defined. Objectives not supported with adequate funds and resources.
1.2 Fund availability	Annual budget preparation based on out-of-date Public Service Financial Regulation Inconsistent budget planning applying multiple approaches to assess fund availability	Much delay as a result inappropriate financial management information of funding. Multiple point of funds checking with the same knowledge
1.2.1.2 Supplementary budget	Missing knowledge to forecast the cost of a specific project at a given time Guessing specific project costs in a given environment at a given season	This task occurs annually in July and inappropriate allocation can result in delays of up to six months before payment can be provided for on-going projects
1.3 Memo for required need (project)	Missing knowledge about project against which the memo is drawn – rather than current needs analysis, staff depend on previous similar projects to draw up memo for project approval Guess knowledge used in most projects	Memos iterated across units and departments with different versions created and delays of two weeks or more
2.3 Bid Evaluation	Inadequate technical knowledge to support bidding evaluation Some reliance on old processes, no engagement with available knowledge on current standard practice Reliance on personal guess knowledge	Severe delay as a result of input from various individual's applying different guesses for the knowledge applied in the project
2.4 Pre-qualification selection	Missing analytical and technical knowledge with related inability to interpret and understand bidding	Diverse interpretations of bid documents from contractors result in this task period taking far longer period that anticipated

	documentation and its contents	
2.6 Production of technical report	Old format of reporting provided – not meeting current technical practices Report quality depends on the individual's own technical knowledge	Delays as a result of the officer having insufficient bidding and project knowledge
3.1 Approving a bid	Out-of-date template Approval does not necessarily follow standard process missing checks	Delays with insufficient or incorrect information provided
3.1.1 Selective bidding	Technical, costing and financial management knowledge incomplete Old information on selective bidding criteria	Delay as a result of management willingness to approve selected bid when it doesn't meet current criteria.

As detailed in table 1, knowledge was often incomplete, for example, the knowledge required to provide the memo that would initiate project approval and execution was not available (Task 1.3: Memo for required need). Available knowledge was often obsolete (and incorrect), for example with budget templates from 2001. We identified that whilst knowledge had been organisationally updated, this knowledge was often held by individuals rather than by departments and was thus not readily available as a reference for those staff undertaking the task.

Whilst there are gaps, for tasks such as budget allocation, there are well established and documented processes. However, although appropriate knowledge was available to staff, observation identified that it was rarely accessed. Instead, staff applied their existing, implicit knowledge to achieve task performance without validating this with organisational knowledge, employing what we refer to as "Guess Knowledge." Guess knowledge was seen in the task processes of staff, including in the provision of analytical and technical information as well as costing and budgeting, without validation with organisational knowledge.

Poor quality and unavailable knowledge had a serious impact on all tasks, with delays occurring during and as a result of the definition stage. "Needs Analysis" was estimated at 2-4 weeks, however, it typically extended to 24 weeks (and sometimes more). This is at least partially attributable to the lack of appropriate knowledge applied during tasks such as "Fund Availability" a key decision point with many projects stalling at this stage. The lack of knowledge of the staff undertaking these tasks has significant impacts on projects with this very first stage of task fulfilment frequently resulting in the provision of incorrect project information. The application of guess knowledge was not limited to a small set of individuals, rather there was widespread use in tasks relating to budget allocation across all of the ministries. Of the 40 projects we surveyed during Outcomes Assessment all had issues related to funding and budget, including insufficient financial information to enable funding allocation and the allocation of projects to inappropriate funding streams and spent funds.

The same task processes are performed by various individuals across units and departments within a ministries or different ministries. For example, funds availability checks are carried out by five different departments in three or more ministries. Ostensibly all staff access and apply the same knowledge, however, our results highlighted that this was not the case. Thus the impact of incorrect knowledge application results in correspondence between the various staff members and the need to repeat tasks. With effectively the same task being completed several times, inappropriate Guess Knowledge by several staff can result in embedded errors. Further, if a project had started, the impact of errors resulted in challenges in paying the contractor, with delays in projects, deliverables and payments.

Overall findings from applying our Knowledge Evaluation Framework were that in the Nigerian public sector there were:

- Obsolete knowledge, gaps and missing knowledge across most tasks
- Existence and frequent use of Guess Knowledge
- Delays in task processes as a result of missing knowledge and as a result of inappropriately applied or incorrect knowledge.
- Common processes performed by various officers in all ministries that were often informed by insufficient knowledge resulting in embedded errors and delays in task fulfilment

5. Discussion

To understand knowledge use in the Nigerian public sector, we developed the Knowledge Evaluation Framework, merging approaches including interviews, task walkthroughs, Hierarchical Task Analysis, Skills-Rules-Knowledge and Swimming Lane Sequence Diagrams. The Knowledge Evaluation Framework enabled us to decompose operational processes into tasks and sub-tasks, and to identify the knowledge required to undertake those tasks. It enabled us to investigate the completeness and correctness of the knowledge needed to enable task fulfilment. This approach highlighted unanticipated knowledge deficits and it is likely that this approach would have relevance to knowledge audits and evaluations in government and other sectors.

There is commitment and belief in knowledge and its management in the Nigerian public sector, with participants in interviews and discussions agreeing that with the application of correct and up-to-date knowledge, organisational business processes can be more efficient and effective. Participants believed the knowledge available to public sector staff was effective, believing the problems of task completion to be a result of other factors. However, our findings identify that rather than being robust and correct the available knowledge was often of poor quality - incomplete, out-of-date and obsolete.

In the Nigerian public sector, there is missing knowledge, with many tasks insufficiently supported. In developing countries much organisational knowledge is implicit, residing in individuals and may not be effectively used in connection with the objectives of the organisations (Acheampong, 2014). This was seen in our study with a lack of knowledge availability. Although this is partially due to knowledge hiding or hoarding (Cerne et al, 2013) it also reflects staff disengagement with organisational knowledge. For example, recent circulars (containing new policy regulations) are rarely incorporated into knowledge sources as part of everyday practice.

Effective knowledge management can impact positively on organisational business process by way of providing up to date knowledge to the right people at the right time (Torabi & El-Den, 2017). However, this study revealed that staff within the Nigerian public sector rarely assessed available knowledge to support the fulfilment of most knowledge tasks. The decision to ignore knowledge documents could be a result of having accessed many other incomplete or incorrect documents. However, there is so little consultation that it could be suggested, that in general, in the Nigerian public sector, staff use guess knowledge and just approximate some solution based on their own knowledge, which unfortunately, is frequently insufficient to fulfil the tasks.

Guess Knowledge is the knowledge presumed to be correct without the possibility of its certainty. It is a term crafted to describe intuitive individual knowledge use rather than that documented as part of organisational working knowledge (Cerne et al, 2013; Cooper, 1951). Guess Knowledge is difficult to codify just like tacit knowledge and is used when organisational knowledge is not readily available, or as we found when staff do not consult the organisational knowledge. The application of Guess Knowledge can have serious impacts, for example, the outcome of the Award Contract task is design and execution of projects (one of the major functions of the Nigerian public sector). However, with staff using Guess Knowledge delays and problems often emerged due to inappropriately applied knowledge. Negative impacts not only included significant delays for the project, but often require senior staff and management intervention to resolve the errors.

The currency and completeness of knowledge is a major concern for future knowledge management in the Nigerian public sector. It requires a lasting solution that addresses knowledge gaps ensuring that the knowledge needed by staff is available and used in performing and fulfilling tasks efficiently and effectively. For knowledge management to have a positive impact on staff performance, the Nigerian public sector needs to introduce regular knowledge audits ensuring that updates are integrated. Placing knowledge online would ensure that all staff could access and deploy the same available, up-to-date knowledge, removing the need to rely on the current non-functional knowledge dissemination and integration approaches.

Whilst ensuring that the knowledge is correct and available could have a significant impact on tasks, this pervasive Guess Knowledge culture will also need to be addressed. Management interventions to ensure that staff are aware of readily available, appropriate knowledge will be needed to achieve culture change, with staff needing to realise that their own implicit knowledge is potentially insufficient to fulfil tasks efficiently and effectively.

Our current and future work continues to focus on the use of knowledge to improve efficiency and effectiveness in the Nigerian and related public sector organisations. We are developing an approach known as Strat-KM, a knowledge management approach, that incorporates the Knowledge Evaluation Framework as its first phase assessing the knowledge baseline of an organisation. Strat-KM is aimed at providing quality knowledge and support management in ensuring that staff are provided with the right knowledge at the right time to enhance organisational performance efficiently and effectively.

6. Conclusion

The Knowledge Evaluation Framework merged interviews, task and knowledge walkthroughs, HTA, SRK and SLSD. Using this approach not only revealed gaps in knowledge in all tasks explored across all ministries in the Nigerian public sector, but also that available knowledge was frequently incorrect. This paucity of knowledge has resulted in use of a coping strategy, where staff depend on their own non-validated or Guess Knowledge in performing task processes. However, rather than Guess Knowledge being applied only in those situations with unavailable or incorrect knowledge, task walkthroughs and observations of task performance highlighted that knowledge was rarely, if ever accessed by staff during task fulfilment. This resulted in significant delays and inefficiencies in achieving operational processes. Thus, whilst providing current, appropriate knowledge online will undoubtedly improve knowledge use in the Nigerian public sector, management intervention will also be required to initiate a culture change that rejects rather than embraces Guess Knowledge.

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