

# TORCH: AN INSTITUTIONAL KNOWLEDGE MANAGEMENT SYSTEM FOR THE DHCA

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“If I have seen further than others, it is by standing on the shoulders of giants.”

-Sir Isaac Newton

## Introduction

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“The issue we had...is some people working on grants just left, and didn’t leave great records for us to look back through. So we spent a lot of time trying to locate things and figure out like, kind of where we were. We spent like that whole first spring trying to figure out like, okay this was going on here this was going on here. And then quite frankly people would just leave, and not leave a lot of great information behind.”

“So just for clarity, you do not have access to your website, in order to update your website, is that correct?”

“Correct, because previous employees would stand up additional websites in the previous administration, with sole access to some of these websites. And so, when they left they didn’t give us the information about how to access those things.”

“But that’s two years ago...that’s over two years ago.”

Knowledge Management is defined by John and JoAnn Girard’s interorganizational study most broadly as “The process of creating, sharing, using and managing the knowledge and information

of an organization” (Girard, 2015). Pragmatically, this definition can be understood as assuring, managing, and maintaining the information and knowledge that allows organizations both public and private to meet their functions. The above exchange took place between members of the Oklahoma State Legislature and officials from Oklahoma State Department of Education (OSDE) regarding over \$1.4 million of federal funds to improve school safety that went unspent, causing the grants to be revoked. With Pamela Smith-Gordon, former Program Manager for Grant Development and compliance stating in an interview that “I could not even get into the programs to monitor” (Humphrey, 2024), it can be reasonably believed that OSDE’s stated mission of “Determining the policies and directing the administration and supervision of the public school system of Oklahoma” to be noticeably hindered at best and placed in jeopardy at worst. Though an extreme situation, the problems of the Oklahoma agency are not exclusive to it, and all organizations are at risk of knowledge loss due to employee turnover, changes in organization structure, poor knowledge management practices, or the simple passage of time (Azaki & Rivett, 2022) (Wood, 2020) (Massingham, 2018). While knowledge loss is an endemic part of organizations in general, effective knowledge management principles can be merged with novel technologies to greatly mitigate naturally occurring knowledge loss effects (Mehr, 2017) (Sense, 2017).

## Background + Status quo

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Artificial intelligence systems, while conceptually existent since the 1950’s, have incurred a rapid increase in sophistication since 2020, and with the advent of OpenAI’s ChatGPT and other similar large language models, (LLM’s) accessibility, scalability, and customizability have improved significantly. Both private and public sector organizations are leveraging these

advancements in seeking to automate tasks, deploy resources more efficiently, and streamline organizational workflows. Because of the general autonomy often granted to local governments by states and the smaller scales of their jurisdictions, many initial U.S case studies of the government implementation of AI systems take place at the county or municipal level.

Commonly, the systems perform basic time or resource-saving tasks such as answering questions, routing requests, or document management tasks within citizen services (Mehr, 2017).

Broadly, Montgomery County, MD has undertaken its own explorations into the potentials of artificial intelligence on two major fronts: firstly, the 2022 signing of a \$90 million memorandum of understanding between the County and stakeholders the University of Maryland, Baltimore; the University of Maryland, College Park; and the University of Maryland Medical System.

Secondly, the introduction of the chatbot dubbed 'Monty' and its subsequent update 'Monty 2.0'. The MOU seeks to create an Institute for Health Computing to boost ongoing public and private research efforts in the North Bethesda area as well as compete for federal grant funding (Depuyt, 2022). In doing so, Montgomery County aligns itself in an area of high interest at the federal level both in the Legislative and Executive branches. This interest is evidenced in the Legislative Branch by the introduction of the Healthcare Enhancement and Learning Through Artificial Intelligence Act (United States House of Representatives, 2024), the Technology Workforce Framework Act (United States Senate, 2024), and the Future of Artificial Intelligence Innovation Act of 2024 (United States Senate, 2024). In the Executive Branch, President Biden's January 2024 Executive Order focused on establishing privacy, security, innovation, and research priorities in both public and private sectors as well as an HHS policy task force on the subject

(The White House, 2023). This order has since been followed by a Special Emphasis Notice from the Department of Health and Human Services indicating priority funding for innovation in healthcare data and artificial intelligence. Monty 2.0 utilizes data fed from the Montgomery County government website in order to answer customer questions regarding services as well as route requests in over 100 languages. Through this increased automation, the County improves the experience of its customers by simplifying and automating the receipt of large swaths of information, freeing up staff resources to pursue other tasks within their workload. These value adds in terms of resource management and citizen services reflect the typically sought outcomes from artificial intelligence implementation at the local and municipal level (Mehr, 2017) (Yigitcanlar, Desousa, Butler, & Roozkhosh, 2020).

This paper is primarily reliant on three observations gleaned from reviews of recent research. Firstly, it can be readily concluded that effective knowledge management and retention is an essential component to the effective function and improvement of organizations (Wood, 2020) (Azaki & Rivett, 2022). Factors of knowledge loss are present within all organizations, as along with staff turnover and restructure, the simple passage of time can also erode information (Massingham, 2018). Secondly, effective government implementation of technology systems, in particular knowledge management systems, are associated with greater degrees of employee competence (Senseuse, 2017) and increased capacity to deliver citizen services (Mehr, 2017). And thirdly, artificial intelligence, already being integrated in the county and beyond, has further potential to increase service delivery capacity and employee competence (Mehr, 2017) (Senseuse, 2017). With this potential in mind, the purpose of this paper is to merge current research and literature, directly conveyed staff needs, and an accompanying policy suite to

illustrate how the Department of Housing and Community Affairs (DHCA) can use a proposed database management system, referred to here as TORCH, along with an accompanying policy recommendation suite, to insulate itself from knowledge loss risks while strengthening institutional memory practices going forward.

## Methodology

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To align the design of the TORCH system with existing best practices and the present needs of the DHCA, the following methodology will detail the information sources, principles, limitations, and use case development of the system.

### 1. Literature review

Conceptual development begins with the summary and synthesis of recent academic research literature, institutional memory case studies within organizations, and technical documents pertaining to the relevant topics concerning the system. These topics include artificial intelligence system design and implementation, knowledge management, institutional memory, e/smart government, and common vectors of knowledge loss or knowledge retention. This review concentrates on literature from 2016 to current day in order to merge pre-COVID understandings with the added lessons and contexts gleaned from the post-pandemic era.

### 1. Field Interviews

Key staff within the DHCA and Montgomery County Government were asked about their experiences with existing internal artificial intelligence enabled tools, pending systems, and knowledge management experiences within their organizations. The purpose of these interviews is to align the top-level research conclusions with the more granular experiences of staff. In doing so, the system can adapt closely to existing workflows and closely tailor its use cases to

organizational realities. The DHCA presents a unique opportunity in this project due to its numerous recently onboarded staff and the addition or restructure of divisions within the agency. To fully leverage the value this can bring to system design, field interviews will include multiple technical staff (defined as individuals involved in the design or implementation of knowledge management or otherwise artificial intelligence enabled systems), two recently onboarded members of management (less than three years' experience in position) with access to predecessor knowledge, and a long tenured (20+ years) employee whose roles have changed or expanded since the COVID-19 pandemic (2020). Additionally, several members of the Office of Landlord Tenant Affairs were given an open forum to discuss the current operations, training, knowledge management practices and potential use cases for the system within the division.

### Level Setting: A Literature Review of Knowledge management, Institutional Memory and Organizational Effectiveness

While the conclusions in the literature decisively point toward effective knowledge management being central to an organization's ability to perform and maintain function over time, a closer examination of the components of effective knowledge management systems and their implementation can inform best practices and identify organizational elements most positively impacted by effective systems. The study of public organizations and the factors of knowledge management within them by Azaki and Co. sheds light on persistent co-determinants of successful knowledge retention. Two large aspects of success along this front are thorough understanding of the organization's structure, which "defines the role and duties of individuals as well as the direction of information flow across different tiers of management within an

organization,” and its culture, which “refers to the basic assumptions guiding an organization and is expressed explicitly through organizational handbooks and implicitly in the daily activities or routines of employees” (Azaki & Rivett, 2022). Under these definitions, the governing concept behind the TORCH system must be one that works within the current and future information flows within the department while streamlining the transfer of knowledge to other individuals as necessary. Understanding existing structure and culture will aid in this by clearly identifying the vectors along which knowledge travels (individuals, departments, positions etc.) Bolstered by Phaladi’s thesis on knowledge management within public organizations (Phaladi, 2011) demonstrates that “70-95% of [organizational] functional knowledge is tacit”. Tacit knowledge is defined as “knowledge that you do not get from being taught, or from books, etc. but get from personal experience, for example when working in a particular organization” (Cambridge Dictionary, n.d.). Additionally, tacit knowledge is recognized as distinct category alongside explicit and implicit knowledge. Explicit knowledge is defined by its clarity, structure, and ease of transfer. Implicit knowledge is defined as the practical application of explicit knowledge, such as methods, best practices, and processes. (Anderson, 2023)

### Field Interviews: Understanding the needs of staff

The conceptualization of the TORCH system draws heavy influence from the directly conveyed experiences of departmental staff, with the purpose of tailoring the prototype framework to existing workflows and building use cases specific to the knowledge management needs of the organization. Technical staff were asked about existing and pending systems in the realm of knowledge or information management, the design principles behind them, and associated



guardrails. The recent members of management with predecessor knowledge access will be asked to describe their onboarding process, the utilization and benefit of tacit predecessor knowledge in their processes, and the transfer of institutional knowledge (especially in the form of heuristics). The long tenured staff member will be asked to describe the buildup of tacit knowledge over their tenure, leadership changes they have witnessed and their perceived effects, and instances of knowledge loss.

### Technical Staff:

Digital Officer, Department of Technology and Enterprise Solutions (“KL”)

Cybersecurity researcher and IT Advisor (“CT”)

Change Management Specialist – Department of Technology and Enterprise Solutions (“MZ”)

KL discussed his involvement in implementing a data classification system for county databases which would automatically allow or deny access to specific databases or files based on security clearance attached to the account. Drawing from his experience in project management and oversight duties on the project, KL first laid out the process of system development and implementation; level setting, determining guardrails, technical specifications and policy, creating operationalization parameters and use case development. This taskflow ensures that systems are built in compliance with relevant laws and regulations and that use cases are developed in line with specific and measurable pre-decided metrics. The next recurring step in system implementation is continuous improvement, which is undertaken by analyzing established key performance indicators (KPI's) and determining technical or policy-based solutions to address any issues. Both the data classification system and potential TORCH

system are primarily internal assets. Because of this, KL conveys that while technical measures of performance will be key in improving system quality and user experience, the paramount metric will be user rating and satisfaction.

CT utilized his academic research capacities at the Trachtenberg School and his advisory and technical capacities with the Montgomery County Council to suggest a simple yet comprehensive security framework in order to anchor the system in the current best practices of data security. Additionally, with the system utilizing artificial intelligence large language models to retrieve, synthesize, and update information, reliability in the form of avoiding ‘hallucinations’ (inaccurate or nonsensical information generated by user query) is paramount. CT’s paradigm has two primary components:

### **1. Machine Security**

Machine security is defined as protecting the system itself from both internal vulnerabilities and external threats. The primary aspects of machine security for the project are security of data, the safeguarding of software against ill-intentioned external actors and maintaining the consistency of the technology and its ability to deliver results.

### **2. Human Security**

Human security is centered around protecting users and stakeholders within the organization from any risks that may be associated with the operation of the system. Primary concerns in this area will be maintaining privacy and confidentiality, insulating the system against bias within the large language model, cultivating transparency in system processes and ensuring users are properly trained and briefed on the purpose and operation of the system.

MZ was a member of the team responsible for the update and redeployment of Monty 2.0, bringing with it an exponential increase in functionality, with the number of possible responses rising from 20 to well over 3000. With intimate knowledge of the architecture of a similar system, the employee was able to suggest technical structures described in the system components section that utilize Microsoft Azure natural language processing, simple input prompt large language models (similar to ChatGPT and others), neural network deep learning and 'self-justification' software that utilize existing technologies available to the county while leveraging the lessons learned from the implementation of Monty. With these insights, technological priority can be assigned to various components that will make up the system, ensuring that errors or issues can be quickly diagnosed and remedied.

**New management with predecessor knowledge:**

**RL** – Manager, Affordable Housing, MPDU Section

**NK** – Manager, Landlord-Tenant Affairs Section

The previous holder of the manager position now serves as Division Chief, and as such is intimately familiar with the nuances and heuristics of the system. The current manager explains that his capabilities rely in large part on tacit knowledge. Previously, the holder of this position served as a Deputy Chief and eventually Division Chief in a separate jurisdiction and he describes his current position as one that mirrors many of the responsibilities of a deputy. While he describes this experience as being beneficial in brokering a smooth transition into the current role, he stresses that the processes of both internal stakeholders and the external actors they

must work with can vary greatly from jurisdiction to jurisdiction and credits having access to his predecessor with allowing him to quickly adapt and synthesize the best practices of his previous position with the necessities of his current one. Additionally, RL states that management styles, personnel, and personalities can vary greatly even in organizations that in theory perform the same or similar functions (local government departments of housing in this case). In having access to, among other intellectual assets, management and operational styles, project outcomes, and resource allocation philosophy, new management can present their own innovations by building from successful predecessor models.

NK serves as manager of the Landlord-Tenant Affairs section, largely responsible for “informing the public of the general rights and responsibilities of tenants and landlords and helping resolve disputes amicably...” As a largely consumer and complaint driven team, they rely on consistent workflows to ensure they can meet the needs of the public, placing uniformity of service as a high priority. NK’s duties as manager include the interpretation of chapter 26 of Montgomery County Housing Code as well as relevant Maryland State law. On this front, NK stated that predecessor access allowed her to streamline her training process as well as arrive with working knowledge of how different provisions of the law affect landlords, tenants and therefore section responses to inquiry. NK expressed the need for administrative support in keeping processes up to date, presenting a fiscal case for automation in ensuring the section’s operating procedure can remain current.

### **Landlord-Tenant Staff**

Along with providing her insights from the perspective of management, NK also facilitated an open forum with landlord tenant staff. Non-managerial staff expressed that standardizing

processes both for newly onboarded staff acclimation and compiling process knowledge over an employee's tenure to be of high, reinforcing a sentiment expressed by Nicole regarding management. Primarily of concern for staff however, was being able to store, track, and access partially completed or concepted initiatives. Referencing COVID-19, they stated that useful initiatives or prospective systems can often be abruptly stopped due to staffing needs elsewhere, with the concepts soon forgotten and progress lost. Uploading these into organization cloud storage was perceived to add to the cluttering of databases, making it more difficult to find any given file. Staff expressed enthusiasm at the prospect of the system to store, summarize, and make accessible these potential projects while relieving them of the time burden of constant organization responsibility.

### **Long Tenured Staff Member**

JH has worked within the county for over 30 years, and over 20 years within the DHCA. Over this time she states that she has been able to build a large knowledge base of not only her own processes, but the processes of those she comes into contact with. Currently, she serves as a Senior Administrative Assistant and HR Specialist, with the latter's responsibilities being temporarily hers due to organizational staffing issues brought on by the COVID-19 pandemic. Her long tenure in the former role, and the nature of the role itself, meant that she was in close contact with leadership, and the professional rapport saw the additional responsibilities delegated to her out of trust. The nature of the pandemic meant that workflows were thrown into flux, and traditional methods of training were inaccessible, leading to a 'learning curve' as she was tasked with assisting departing HR staff with crucial organizational work with little time to

learn processes or best practices. She credits her experience and repertoire of knowledge with allowing her to meet the organizations needs but observes this would be much more difficult for a less experienced employee, recognizing the difficulty in imparting her experience to others in situations where less training time is available.

## Policy Analysis

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The recommended policy actions for both the DHCA and Council are designed to incorporate best practices of knowledge management, novel technological systems applicable for local government, and the experiences and perspectives gleaned from field interviews. Noting the consistent observation that cultural factors correspond with less or more successful knowledge management practices (Wood, 2020) (Azaki & Rivett, 2022), the recommended actions stem from recognition of a staff-development focused culture in creativity and employee input to processes is encouraged. The department can use recommendations to orient staff along cultural lines towards easier adoption of the TORCH system alongside technical understanding and training.

## Policy Recommendations

Along with the recommended implementation of the TORCH database system in use cases deemed necessary, policy recommendations for both the Montgomery County Council and Department of Housing and Community Affairs (DHCA) are as follows:

### DHCA

1. Adopting post work project/new work process write up protocols

## 2. Test Cases

To ensure familiarity with the standard prompt-and-response system of large language models that the TORCH system will integrate, leadership should support the loading of non-sensitive, non-pertinent files into existing models to demonstrate how the system would store and categorize inputs before generating relevant outputs. Test cases will serve an important twofold function. First, the uploaded inputs will begin to form the foundations of the systems knowledge base using the data classification systems (permission levels for access to files, tags and sub tags of categorization). Secondly, staff can be tasked with contributing to this initial knowledge base which serves as natural training to the prompt-and-response style text generation that important system features will rely on.

## 3. System KPI's (Key Performance Indicators)

Because TORCH is a user driven system, ultimately the metrics of success will be staff driven. After being briefed of the purposes of the system in improving function and workflows, employees should be encouraged to contribute input into setting measures of success.

## Montgomery County Council

### 1. Leadership Knowledge Management Level Setting

The Council should conduct meetings with DHCA leadership to understand current knowledge management practices, identify any macro level fragilities or knowledge loss risks, and set concrete objectives to lower knowledge loss in the organization. This body should meet once or twice quarterly, and is distinguished by its focus on leadership in the development of long term-knowledge management objectives of the organization.

## 2. Knowledge Management Task Force

By creating a standing meeting with council and DHCA staff, the initial high-level objectives set by leadership meetings can be examined at a more granular level to allow potential solutions to be developed. In addition, this will facilitate the exchange of best practices and metric management in the overall conversation around institutional memory, which is relevant to both the DHCA and agencies in general. This information will form a central part of the diagnostics and report generation process when conducting test cases or evaluating overall system efficacy. Primarily, it is recommended that at least one metric be established for the measuring how the system optimizes training, operations, and strategy development within the organization. It should be noted that technical staff favor measuring user satisfaction with various system elements to be a highly effective tool in technical, process, and implementation improvement.

Additionally, field interviews inform us that the experiences of management, administrators, employees, and managers may vary as they utilize the technology for their own unique work functions. Because of this, leadership should encourage metric establishment in all the mentioned work capacities in order to allow the establishment of a comprehensive rubric for measuring positive impact and potential externalities.

This task force should be composed of staff from both teams selected by respective leadership for corresponding skillsets and technical savvy. Meeting twice monthly, or three times within every two-month span, this task force should focus on the implementation and oversight of institutional memory goals set by leadership and determine applicability of extracted knowledge to other departments through expansion of the body or consultation with representatives from the county organization in question.



## System Components

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The technical components of the system will largely be described at the macro level by function, with individual implementation preferences left up to relevant decision makers discretion. It should be noted however, that both highlighted components were selected both for their utility and their presence on the Microsoft Azure platform, already in use by the County, as well as their compatibility with process recommendations in helping to orient staff culturally and technologically. Along with somewhat familiar standard database characteristics (cloud storage archives, permission-based access to data, cross departmental capability, changelogs etc.) specialized components selected to enhance user experience with the technology will be described below.

### 1. Large Language Models (LLM's)/ Natural language processors

Natural language processing allows systems to understand human language inputs by analyzing them computationally. Within closed systems, such as the TORCH database, the propensity for the improvement of the system is constant due to a limited (even when expansive) amount of data. Because of this closed system, the potential for nonsensical or non-pertinent responses to prompts is greatly decreased, due to the only accessible inputs to compile for response being relevant to the organization in some way. These inputs will serve as the foundation to an important component of natural language processing technology: natural language generation, “the process of producing phrases, sentences, and paragraphs that are meaningful from an

internal representation.” (Khurana, Koli, & Singh, 2022). This will enable the system to not only store knowledge for easy direct access, but also generate synthesized summaries by compiling relevant insights using context markers.

## 2. Explainable AI (XAI)

With the goal of the system being the preservation of high-quality knowledge for use by actors within the organization, the integration of LLM’s must account for the existence of ‘hallucination’ outputs that are present in other systems, in which the system generates nonsensical or invalid outputs in response to prompts. Along with a relatively standard feedback system for generated responses in which outputs are rated ‘relevant’ or ‘not relevant’ by users, the TORCH system mitigates this risk through the usage of ‘Explainable AI’, or XAI technology. Under an XAI governance for the large language model undergirding the system, all generated outputs by the LLM will include explanations of how the output was generated based on search criteria (Ex. How a policy summary was constructed using available information inputs, how a series of decision maker opinions were made to relate to one another via language and context analysis, etc.). This will allow generated responses to prompts to be displayed alongside detail into the system logic used to create the response, allowing for easy diagnostics. These XAI systems, to ensure the highest level of system integrity, will follow the principles of secure XAI systems as put forward by the National Institute of Standards and Technology. Chiefly, these are the presence of accompanying evidence to an output, reasonable clarity of evidence to users, accuracy of process evidence, and correct conformity of system responses to the intended purpose of the system. (Phillips, Hahn, Fontana, Yates, & Greene, 2021) These principles are purposely selected for their straightforwardness and simplicity. The purpose of their incorporation is to serve as initial performance indicators that staff and stakeholders can build

from. By keeping the first metrics high level, the organization can leverage the creativity and experiences of staff in setting future, more precise ones that are downstream of established federal declarations, ensuring system usage innovations can continue largely unabated.

The presence of these components ensures that the knowledge management task force will have detailed insight into potential gaps in institutional memory due to previous ineffective practice or employee departure. Because initial knowledge inputs will make their contents searchable inside sophisticated language processing technology, gaps in institutional memory can easily be identified by its correspondence to a failure to generate a relevant prompt from available system information. In addition, LLM's based test cases can support test cases use case and strategy development for DHCA-Council leadership meetings.

## Conclusion

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The TORCH system offers organizations more clarity of information access and improvement by leveraging familiar and novel technologies in a fashion designed to enhance human driven processes rather than supplant them. By eliminating the upkeep requirements and limited features of standard databases while incorporating technologies that reflect the dynamic nature of organizations, knowledge can be more efficiently adapted to meet the changing needs of the department while keeping best practices in place. Governing these systems downstream from established federal and industry standards ensures the ability to maintain a high degree of user confidence in functionality, transparency, and consistency.

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