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Agent-mediated Knowledge Recovery: The Case of Turnover-induced Knowledge Loss in a Knowledge-intensive Institution

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Abstract

The retention of tacit knowledge within organizations, particularly during employee transitions, poses a significant challenge in business settings. This problem is often exacerbated by the underutilization of technology to structure and retain this knowledge. To address this issue, this study proposes an agent-mediated model for knowledge recovery aimed at minimizing knowledge loss by identifying essential information in knowledge repositories and transforming unstructured data into structured format. This study adopts a qualitative case study methodology, employing semi-structured interviews and observational techniques for data collection. Findings, as elucidated through Process-People-Technology (PPT) analysis, highlight the value of understanding routine human tasks in creating rule-based process flows. The proposed CIDM Model (Connect-Identify-Decide-Method) entails of agents, equipped with natural language processing capabilities, which may discern, comprehend, and act on unstructured messages. Additionally, the model enables these agents to identify the roles and responsibilities of message senders and recipients, leading to a more informed decision-making process concerning the use of obtained information. The study highlights the importance of a solution for a more structured, efficient means of retaining organizational knowledge, potentially revolutionizing current management practices.

Keywords: CIDM Model, Process-People-Technology (PPT), Tacit Knowledge, Agent-Mediated, Knowledge Recovery, Knowledge Loss

Introduction

Regeneration of knowledge retention processes and practices, and being innovative towards knowledge continuity, are deemed important to a knowledge-intensive institution, especially when the institution is still newly established. With the current trend of hiring employees as

contract basis (e.g., 2-year contract), often employees do not remain in the same organisation in a full cycle of a project, or a full cycle of student cohort if it is in a knowledge institution (e.g., 3-year Bachelor degree programme). In addition to that, there are significant situations that cause knowledge discontinuity when an employee resigned or completed his or her contract term months before a new employee joins the organisation to take over the job. In other words, proper handover is quite impossible, especially if most of the knowledge is in tacit form.

Regardless of the hype in digitalisation of business processes and using cloud technology for knowledge repository, an unaligned standard of procedure for technology governance with the business processes and employees resigning-hiring gap have caused critical situations in terms of proper knowledge transfer. Due to the main concern of reducing cost and removing waste, a procedure of deleting (i.e., not archiving) cloud-based folders or personal knowledge repository owned by a former employee, whose tasks have not been handed over to a new employee, have added salt to the wound. In a case of a knowledge-intensive organisation, this has happened and affected a newly established project of two years, which requires knowledgeable and experienced employee to continue and improve the project. An insight was retrieved from a representative of top management regarding this matter.

From the perspective of top management (i.e., strategic level of an organisation), technology or information and communication technology (ICT) is merely a service to support the processes in the organisation, and organisation should not depend totally on the technology to solve all problems and to store all knowledge. The main brain behind organisational knowledge is still embedded between the ears of every employee working in the institution. Having said this, the improper job handover from one employee to another upon resignation of the former should not be an issue, unless the job to be handed over are mainly in the form of tacit knowledge and experience. This should be observed as critical at the top management level, with regards to the critical situations in strategically sustaining the business.

Another reason behind this opinion is to ensure that knowledge growth is not hindered because of technology nor the absence of explicit knowledge stored in the organisation. Knowledge continuity should be empowered with learning processes and continuous improvement in work processes, in which change is a must. An effective employee is one who could improve and make changes in the work environment, instead of merely follows and adapts in the new work environment.

Back to the main question in hand, what can be done for the case of personal knowledge repository removal upon strict standard of procedure governed by a corporate-led knowledge-intensive organisation? If knowledge handover is not perceived as important at operational level, it is necessary to mitigate the potential knowledge loss at this level. If knowledge loss can be predicted, it is critical to perform knowledge recovery, especially when the only data type available for recovery is in the form of unstructured data.

Looking at the research opportunity in hand, the purpose of this study is to develop an agent-mediated model to mitigate knowledge loss by identifying significant information in knowledge repository and converting the unstructured data into structured data. This paper presents the findings and a conceptual model as the outcome of this research.

Knowledge Loss and Recovery

Turnover-induced knowledge loss has been reported in previous research, especially in organisations managing software development projects (Rigby et al., 2016; Nassif & Robillard,

2017) and in knowledge-intensive institutions (Ismail & Suhaimi, 2021; Ismail, 2016). Before one could understand the knowledge loss and knowledge recovery, it is important to realise that knowledge continuity is highly significant for an organisation. Analogous to business continuity, which refers to ensuring that operations are backed up should a catastrophic event render the business no longer operational (e.g., a fire, natural disaster), knowledge continuity on the other hand refers to ensuring that no critical knowledge is lost due to employees leaving the firm because of retirement, resignation, termination, or other reasons (Dalkir, 2017). From the concept of knowledge management, knowledge continuity could be assured when the significant knowledge management processes are in place in the organisation. One of the most important processes is the knowledge retrieval, which is a process of returning or delivering information in a structured form, consistent with human cognitive processes as opposed to simple lists of data items (Ferreira, 2009). Knowledge capture and recycling, as what the knowledge retrieval is about, is very important in organisations today, as it improves the conditions for training and coaching new employees and technical key people and is a key to the development and evolution of the organisation (Ferreira, 2009).

As an organisation acquired and retained knowledge within its working environment, it creates the organisational memory in the set of knowledge repositories (Croasdell et al., 2003), and this knowledge is accessible to be reused or recycled by people who need it the most. The process of reusing knowledge starts with the creation or capture of knowledge, storing of knowledge, and dissemination of knowledge (Farooq, 2020), and different people have different requirements for knowledge repositories (Markus, 2001). This brings to the diverse needs and criteria of what should be included when building and implementing knowledge repositories. One of the needs is to recover loss knowledge, which is deem the most challenging of all.

Imagine what will happen when the knowledge that is vital to the company's development and evolution is loss as the employees walk out with the knowledge they have gained, nurtured, cultivated, experienced, and stored in their mind during their tenure in the company. If the employee is a key technical person who has been the reference point for the whole company, it would be a waste of energy, time, and resources to gain and train his or her replacement, and obviously impossible to gain the exact same knowledge that has been tailored to the company's history, environment, and experience. From the perspective of the IT-supported knowledge repository, knowledge loss is the loss of relevant knowledge that was intended to stay in the organisation (Durst & Aggestam, 2017). The loss of critical knowledge through employee turnover involves what the departing employees know about their job tasks, as well as who they know and collaborate with to get work done (Sparrow, 2011; Massingham, 2018). Bear in mind, not all knowledge is written or documented in explicit form, and the examples given here are mainly in tacit form of know-what, know-how and know-who.

There are many reasons behind knowledge loss, which can be observed from the perspective of knowledge risks in organisations. In relating to this paper, knowledge loss can happen because of the following factors (Zieba, Durst, Gonsiorowska & Zralov, 2021): missing or inadequate competencies of organisational members; digitalisation risks; risks related to knowledge gaps; risks of improper application of knowledge; continuity risks; communication risks; and knowledge transfer risks.

From the knowledge risk factors mentioned above, it is astonishing to find that knowledge loss can occur because of digitalisation risks. As stated in the introduction of this

paper, the reliance on cloud-based digital storage and backups for all data, including personal accounts and repositories, have caused an issue of knowledge loss, when it mismatches with the common practice of deleting the accounts once the employees leave the company. It has caused the continuity risks as well as knowledge transfer risks. As a result, it could cause a situation to occur when there is a missing or inadequate competencies of organisational members. It may be realised here that there are huge knowledge gaps among the management, departments, and employees at operational level, which have caused another set of risks to knowledge loss. Eventually, the knowledge loss is impacted by the risks of improper application of knowledge, when the less-experienced employees are hired to take up the tasks related to the lost organisational knowledge.

Although it is often believed that knowledge loss commonly happens due to the high employee turnover (Winkelen & McDermott, 2008), it is also possible to occur when the company practices organisational restructuring. When the organisation restructures, valuable knowledge that is embedded in the relationships between employees often loses too (Martins & Meyer, 2012). This proves the fundamental theory of the renown SECI Model by Nonaka and Takeuchi (1995), which stated that tacit knowledge is transferred from human to human through socialisation during the process of knowledge and experience sharing, which include observation, imitation, and apprenticeship practice. These relationships between the two humans during the socialisation stage ensures the retainment of the knowledge within the working environment (Nonaka & Takeuchi, 1995). When the relationships are lost due to the change in the work environment, it brings the effect of knowledge loss.

One way to mitigate the risk of knowledge loss is to create, maintain, and continuously improve a knowledge repository. In a glance, knowledge repository is a system that captures, stores, and manages organisational knowledge, as it helps the organisation to capture and preserve the not-easily-codified tacit knowledge embedded in the minds of the individuals. In addition to that, knowledge repositories make it easier for organisations to make knowledge accessible to employees, leading to the increased knowledge sharing and collaboration. The more knowledge is shared among the people in the organisation, the less possibility for knowledge to be loss when one leaves the company.

Knowledge repository is defined differently by different people, depending on their perspective of needs. Knowledge repository is said to be commonly used to store and manage explicit knowledge from knowledge worker (Fitriasari et al., 2021), as it is a computerised system that maintains various digital resources to be accessed by the users electronically (Zamani & Izhar, 2018). On the other hand, knowledge repository is also referred to as a wide range of knowledge domains across various subject areas, not limited to only computing and business processes within a company (Zheng & Dahl, 2010). What makes knowledge repository different than other knowledge storages is the way the domains deposited in the repository are connected by semantic rules, accessible through domain identifiers and classes (Zheng & Dahl, 2010). The key design components for knowledge repository are the goal analysis, task analysis, user characteristics, and other components that are identified as significant to the needs to discover and recover the knowledge within it. Having said this, semantic rules could be used to perform knowledge recovery with the support of intelligent agents.

Assuming that knowledge is lost and there is lack of knowledge transfer or socialisation happening in the organisation, how could this knowledge be recovered? The aspect of knowledge recovery is leaning towards the technical side of knowledge management

practices, commonly related to knowledge repository, storage, access, and even mining. As highlighted in a study, knowledge repositories can be effective in helping organizations to recover knowledge that has been lost or forgotten, as well as improve their innovation performance and make better decisions (Acharya & Mishra, 2017). Yet, these practices could only come to light when the knowledge is already known beforehand to be identified, captured, codified, and stored. In other words, the knowledge recovery and the knowledge management practices are like chicken-and-egg situation, a question of which one should come first.

Knowledge recovery is critically important to an organisation, especially for a knowledge-intensive organisation. It is considered as one of the social processes that became evident with the usage of technology and organisational memory, in which knowledge is the key that links the two areas, i.e., technology and memory (Burke & Speed, 2014). By having knowledge recovery process in place, organisations can avoid the costs and disruptions affected by knowledge loss, as well as improve their innovation and decision-making capabilities. Yet, there is no one right solution for knowledge recovery for any organisation because each individual organisation is unique in terms of business operations and critical needs.

Intelligent Software Agents in Knowledge Management

The knowledge recovery process includes innovative design that encapsulates knowledge transfer, storage, and expansion Nisha (2018), and its practices are often dependent and connected to the usage of information technology and information system. In recent studies, data mining along with business intelligence is highlighted as the right tool for knowledge recovery process. Since data mining and business intelligence are based on the fundamentals of artificial intelligence, it is an opportunity to explore other technologies to facilitate knowledge recovery, such as intelligent software agents (or intelligent agents), and software bots, to name a few. An intelligent agent is an independent entity, with tasks to act and direct its activity to achieve the assigned objectives within an environment that uses sensors and related actuators to monitor them (Dhatterwal et al., 2021). Being an artificial being, they are smart agents that can learn and use knowledge in order to achieve the assigned objectives Kaswan et al (2011), thanks to the semantic rules. With the right tuning, programming, and case-based reasoning, intelligent agents can be trained to mediate the mundane tasks of humans (Ismail & Ahmad, 2011; Mohammed, Abdul Majid & Ahmad), which include tasks in recovering data, information, and knowledge.

Technically, it is found that intelligent software agents could be useful for knowledge recovery and mitigating knowledge loss (Ismail & Suhaimi, 2021; Ismail, 2016). This technical domain has expanded into the concept of Agent of Things (AoT), derived from the popular domain of Internet of Things (IoT), but focusing on the intelligent software developed within the environment where the software agent sits. As part of IoT, with or without the strength and capability of the Internet, AoT can “live” within a networked environment, as well as across applications within a computer. In previous research on AoT in social intelligence environment (Ismail & Ahmad, 2014), the idea of proactive multi-agent system is proposed to manifest social intelligence within a virtual environment without humans’ interventions, which involve network system and knowledge repository. The interaction among software agents, located at different locations within the environment and assigned with specific individual tasks, facilitates the identification and direction of knowledge as triggered by the change of conditions sensed within the environment.

In another research, it is proven that the concept of agent-mediation could automate the mundane tasks of human employees in terms of work progress reporting, which include knowledge retrieval from unstructured data and information, to be documented, stored, and reported to the right destination or recipient (Ismail, Jamaludin & Mostafa, 2021). This concept is applicable to the need for knowledge recovery, in which the knowledge is retrieved from unstructured data and information, then documented, stored, and published to the person who oversees the tasks.

Qualitative Research Settings

This research is based on a case organisation, acronymed as ABI to remain anonymous, which is a private non-profit institution focusing on academic and related services. In relating to this real case of a knowledge-intensive institution, this research performed an observation and interview to understand the situation in hand. Based on the interview conducted for an hour on 19 April 2022, and an observation that spanned across two months in early 2022, this research formalises the findings as presented in this paper. The focus on the issues is related to the work processes, technology implementation and usage, as well as the people working on the processes using the technology. In short, the concept of People-Process-Technology (PPT), which was introduced in 1964 by Leavitt Prodan et al (2015), is applied to facilitate the collection and analysis of data.

A total number of nine respondents were involved in this study, mainly the interview, and they play different roles in the case process. Two respondents played the role of managers (i.e., management), two respondents were from the operational level (i.e., operations), two respondents were seconded from other departments to administer and coordinate the work process in study (i.e., administrative), and three respondents were from the technical department (i.e., technical). The interview was recorded and transcribed to produce the interview script. The script was then analysed using content analysis, in which the presence and meaning of the content were identified, and relationships between them and the theoretical concept of PPT were documented.

For further investigation and analysis on the technological solution side, the document method was performed on top of the interview and observation. Documents and data related to the issues are analysed to understand the data level of the situation in order to solve the issues in hand. Bear in mind that the domain knowledge is critical in order to propose the solution, i.e., the agent-mediated model, in which the knowledge is gained from and supported by experts in the case organisation.

Results and Findings

The interview respondent specified that majority of the employees in the case organisation (ABI) is hired as contract-basis, aligned with the company policy. The reason behind this approach is to put the employees on their toes and be productive and hardworking, as well as to be thoughtful for the next achievement in career. On the other side of the coin, this contract-based approach would make the employees feel that they should not rely on the stability of the job. Towards the end of an employee's contract term, the case organisation will start head-hunting for new candidates to be hired. Searching for the next person often takes a long time, especially for officers with high responsibility, which leads to a gap in duration between the resignation of current employee and the employment start date of the new employee, leading to a less proper job handover between them.

Nevertheless, the most important aspect of a job handover, from the perspective of top management, is more towards knowledge transfer on culture and situation within the organisation, in which reflected from the experience gained during the contract term. Hence, it is perceived that the job handover is highly critical only at the top management level of the case organisation. The knowledge transferred during the job handover at this level is considered the "unwritten things" or tacit, in which the former person will provide the "right advice at the entry point" to the latter.

A quick insight was gained from the ICT department in terms of knowledge repository. Every employee in the case organisation is given a cloud-based email account and a mobile computer. Every file saved in the mobile computer is synchronised with the files in a cloud-based repository. This cloud-based "personal" repository is accessed using the same email account assigned to each employee. When an employee resigns from the company, the email account will be deleted, the mobile computer is returned to the department, and all files saved in the cloud-based personal repository will be deleted. This is the standard of procedure governed by the ICT department in the case organisation, and it is realised to be the start of the digitalisation risks.

Based on these situation and work processes, a critical issue came to light when a person-in-charge of a journal management process resigned from the organisation months before a new person-in-charge is hired. The journal publication was a new project initiated by the former employee of ABI, and he was the main person who created, maintained, and managed all important documents related to the journal management process. When he left the company, as stated in the ICT standard of procedure, his personal repository and email account governed by ABI were deleted, i.e., not archived. Since he was the only person who orchestrated the whole work processes for the project, the knowledge of the work processes is "deleted" along with the cloud-based repository.

In many cases, there is no critical need to retrieve any explicit knowledge from the deleted repositories, if the work processes are shared by multiple employees and proper job handover is performed. However, for the case of this journal management system, the knowledge loss is vital and critical for the continuity of the project. Nevertheless, it is a blessing that a generic email account was created during the project establishment, which was used to receive emails and send emails to authors, reviewers, and other stakeholders. This email becomes the sole source of knowledge acquisition and retrieval to solve the knowledge loss issue in hand. However, not all information is properly stored in this generic email, and the domain knowledge is still critical to understand all data and information found in this repository.

Table 1 presents the summary of findings from the interview, observation, and document, providing the input to the model development for this research. The summary includes the People-Process-Technology (PPT) analysis, which relates the findings with the design of the conceptual model. The People element in the PPT analysis is derived from the aspect of human user, and how the software agent could be designed to mediate the tasks for the respective human user; hence the indication of "People (Agent)" is used in Table 1. This summary 1 is analysed in the next section for agent-mediated knowledge recovery model design.

Table 1
Summary of Findings and PPT Analysis

Interview	Observation	Document	PPT Analysis
Technology is there to assist humans and make the work process easier for humans	Without proper interface and knowledge on where what knowledge is stored, it is not easy to rely on the technology to understand the process	No evidence of process flow or standard of procedure	Process: Understanding the humans' mundane tasks could assist in designing the rule-based process flow for the proposed model
Technological knowledge is stored but not the human mind	Explicit knowledge is very unstructured, and not all is captured in the system	The only documents remained valid are the unstructured messages in emails	People (Agent): The proposed agent(s) should be equipped with capabilities of natural language processing (NLP) to identify, understand, and perform tasks on the unstructured messages
The employee turnover has no effect on the work processes because data is there	Data can only be there if it is stored, and it can only be retrieved if the person knows where to retrieve it from	Data is in unstructured form and requires knowledge to retrieve it	People (Agent) and Process: The proposed agent(s) could be empowered with the capability to identify the role and responsibility of the sender and recipient of the unstructured message, to decide what to do with the identified information
The hired person must be capable to understand the stored knowledge	Provided that the person has prior knowledge and experience working in the same environment, he/she is capable to understand the stored knowledge	Explicit documents are either do not exist or unclear to the hired person	Technology: This justifies the need to program intelligent agent(s) for knowledge recovery, in facilitating humans on what they do not know

The CIDM Model for Agent-mediated Knowledge Recovery

Further analysis is conducted to understand the needs for criteria and capabilities of the agents to be developed in the model design. The key point is to have a rule-based process flow, NLP capabilities to understand the meta data and the content of the unstructured data, including roles and responsibilities of the participants. Table 2 presents the requirements aligned to the PPT analysis.

Table 2
From PPT Analysis to Model Design Requirements

PPT Analysis	**Model Design Requirements**
Process: Understanding the humans' mundane tasks could assist in designing the rule-based process flow for the proposed model	Rule-based process flow should be designed based on journal managing team's mundane tasks of knowledge acquisition, codification, and dissemination.
People (Agent): The proposed agent(s) should be equipped with capabilities of natural language processing (NLP) to identify, understand, and perform tasks on the unstructured messages	Agents are assigned with NLP capabilities to identify relevant unstructured data in the repository, decide whether to extract or not the information if found significant, and perform the right method to record by applying prior-determined codification.
People (Agent) and Process: The proposed agent(s) could be empowered with the capability to identify the role and responsibility of the sender and recipient of the unstructured message, to decide what to do with the identified information	At the commencement of the agents' rule-based process, an agent is assigned to connect to the repository to gain access to the meta data of the information, which include the human participant recorded in the unstructured data or information.
Technology: This justifies the need to program intelligent agent(s) for knowledge recovery, in facilitating humans on what they do not know	The model should apply the domain knowledge of journal management system for identification of knowledge needed to be recorded and disseminated to the right people, with proper information.

From the tabulated requirements, a conceptual model is proposed, as shown in Figure 1. There are four software agents working together in the agent environment, named as their main tasks:

- *Connect Agent* to "connect" and access knowledge repository;
- *Identify Agent* to "identify" relevant data and information in the repository;
- *Decide Agent* that "decides" if the data or information found is relevant and significant; and
- *Method Agent* that "knows" what to do with the significant data/information, based on the type of data/information that is found.

Figure 1 shows the graphical representation of the process flow, with the assigned intelligent agents as mentioned above. The processes involved in this environment are access to the knowledge repository, analysis on unstructured data in the repository, extraction of significant information, recording of information in structured format, updating and saving the structured data, tagging of unstructured data as completed for reporting, and notification of session completion to be published to the initial agent (i.e., Connect Agent) and its human counterpart.

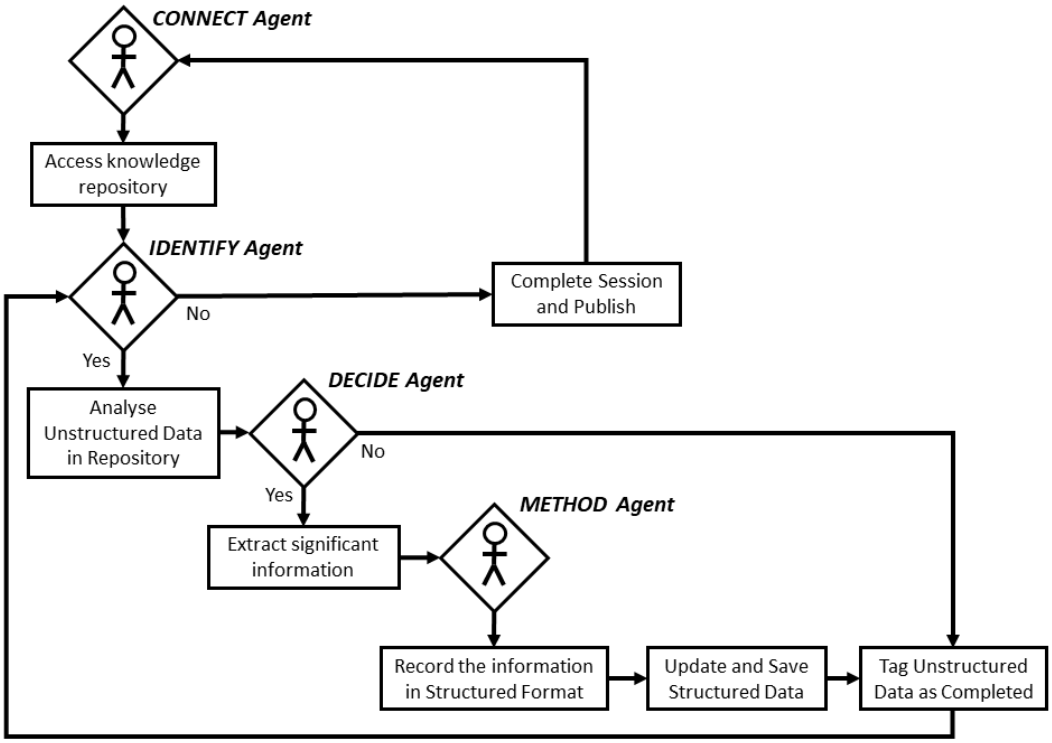

Figure 1. Agent-mediated CIDM Model for Knowledge Recovery

Discussion and Conclusion

This research highlights the intricate relationship between People, Process, and Technology (PPT) in the context of knowledge management in organizations. The findings reveal the ineffectiveness of managing knowledge retention and transfer, especially in job handovers and technological procedures that do not archive essential knowledge repositories of outgoing employees. The loss of tacit knowledge as a result of turnover, paired with a lack of proper knowledge transfer mechanisms and policies, can severely impact an organization's performance and continuity of projects.

The findings of this study highlight the crucial role of well-designed technological interventions in knowledge management to mitigate knowledge loss, a concern raised by various researchers in the field (Durst & Aggestam, 2017; Acharya & Mishra, 2017). Consistent with Nonaka and Takeuchi 's (1995) SECI model, we highlight the importance of converting tacit knowledge to explicit, particularly when there is high turnover or inadequate handover processes. Our Process-People-Technology (PPT) analysis reveals that understanding human tasks could aid in developing rule-based process flow, and the incorporation of Natural Language Processing (NLP) capabilities in agent models could efficiently handle unstructured data. Recognizing the roles and responsibilities of participants involved in information exchange can further enhance the decision-making process of these agents.

In response to these requirements, we proposed the CIDM Model, where intelligent software agents, each carrying out specialized tasks to mitigate the identified knowledge management issues. The agents, i.e., Connect, Identify, Decide, and Method, together orchestrate a workflow that ensures consistent and accurate knowledge recovery and preservation, thereby addressing the risks associated with knowledge loss during employee turnover. The developed CIDM model seeks to fill the gap recognized by Rigby et al (2016); Nassif and Robillard (2017); Ismail and Suhaimi (2021) concerning the lack of practical, technological applications of knowledge management theories. The model leverages NLP

capabilities and rule-based process flow, offering a solution for structured retention and recovery of tacit and explicit knowledge in organizations. This contributes towards operationalizing Farooq's (2020) concept of leveraging knowledge as a key resource for organizational competitiveness.

In conclusion, this study emphasizes the importance of considering both technological and human-oriented strategies in knowledge management. The implications of these findings are particularly relevant for organizations utilizing contract-based employment, calling for strategic adjustments in their knowledge management and human resources practices. Moreover, the proposed CIDM Model offers a potential solution that could be further explored, improved, and adapted to suit the specific needs of such organizations. Future research could focus on the practical implementation and refinement of this model, and on investigating its effectiveness in different organizational contexts.

References

Acharya, A., & Mishra, B. (2017). Exploring the Relationship between Organizational Structure and Knowledge Retention: A Study of the Indian Infrastructure Consulting Sector, *Journal of Knowledge Management*, 21(4), 961-985.

Ferreira, A. J. C. (2009). KC-PLM: Knowledge Collaborative Product Lifecycle Management. In M. Cruz-Cunha, E. Oliveira, A. Tavares, & L. Ferreira (Eds.), *Handbook of Research on Social Dimensions of Semantic Technologies and Web Services* (pp. 886-900). Pennsylvania: IGI Global.

Burke, M. E., & Speed, C. (2014). *Knowledge Recovery: Applications of Technology and Memory*. In M.G. Michael, & K. Michael (Eds.) *Uberveillance and the Social Implications of Microchip Implants: Emerging Technologies* (pp. 133-142). Pennsylvania: IGI Global.

Croasdell, D. T., Jennex, M., Yu, Z., & Christianson, T. (2003). A Meta-Analysis of Methodologies for Research in Knowledge Management, Organizational Learning and Organizational Memory: Five Years at HICSS, *Proceedings of the 36th Annual Hawaii International Conference on System Sciences, 2003, Big Island, HI, USA*, 9.

Dalkir, K. (2017). The Role of Human Resources (HR) in Tacit Knowledge Sharing. In D. Jaziri-Bouagina, & G.L. Jamil (Eds.), *Handbook of Research on Tacit Knowledge Management for Organizational Success* (pp. 364-386). Pennsylvania: IGI Global.

Dhatterwal, J. S., Kaswan, K. S., & Preety. (2021). Intelligent Agent Based Case Base Reasoning Systems Build Knowledge Representation in COVID-19 Analysis of Recovery of Infectious Patients. In Nandan Mohanty, S., Saxena, S.K., Satpathy, S., & Chatterjee, J.M. (Eds.) *Applications of Artificial Intelligence in COVID-19. Medical Virology: From Pathogenesis to Disease Control* (pp. 185-209). Springer: Singapore.

Durst, S., & Aggestam, L. (2017). Using IT-Supported Knowledge Repositories for Succession Planning in SMEs: How to Deal with Knowledge Loss?. In P.O. de Pablos, & R. Tennyson (Eds.), *Handbook of Research on Human Resources Strategies for the New Millennial Workforce* (pp. 393-406). Pennsylvania: IGI Global.

Farooq, R. (2020). Developing a Conceptual Framework of Knowledge Management, *International Journal of Innovation Science*, 11(1), 139-160.

Fitriasari, N. S., Anzani, L., Widiyanto, K., Lukman, Apriansyah, M. R., Setiawan, M. A., Asnawiah, L. P., & Shafa, M. G. (2021). IoT-based Knowledge Repository Design for Supporting Knowledge Integration within the Marine Information System Study Program, *Journal of Physics: Conference Series*, 1811 012101.

Ismail, S. (2016). A Multi-agent Model to Mitigate Knowledge Loss in Continuous Academic Quality Improvement Effort, *Journal of Computing Technologies and Creative Content (JTeC)*, 1(1), 19-22.

Ismail, S., & Ahmad, M. S. (2011). Personal Intelligence in Collective Goals: A Bottom-Up Approach from PKM to OKM. *Proceedings of 7th International Conference on IT in Asia (CITA)*.

Ismail, S., & Ahmad, M. S. (2014). Deploying the Concept of Agents of Things for Social Intelligence in Knowledge Management. *Proceedings of the 13th International Conference on Applied Computer and Applied Computational Science (ACACOS '14)*, WSEAS, 229-234.

Ismail, S., & Suhaimi, A. A. A. (2021). Conceptual Framework of kXpert: Knowledge-Based Information Retrieval for Expert Profiling, *Turkish Journal of Computer and Mathematics Education*, 12(3), 2064-2070.

Ismail, S., Jamaludin, N., & Mostafa, S. A. (2021). "Do you trust me?" – The Outlook of Belief, Desire and Intention. *The Fourth Industrial Revolution, Knowledge Management International Conference (KMICe) 2021*, 162-167.

Markus, L. M. (2001). Toward a Theory of Knowledge Reuse: Types of Knowledge Reuse Situations and Factors in Reuse Success, *Journal of Management Information Systems*, 18(1), 57-93.

Martins, E. C., & Meyer, H. W. J. (2012) Organizational and Behavioral Factors that Influence Knowledge Retention, *Journal of Knowledge Management*, 16(1), 77-96.

Massingham, P. R. (2018). Measuring the Impact of Knowledge Loss: A Longitudinal Study, *Journal of Knowledge Management*, 22(4), 721-758.

Mohammed, K. A., Abdul Majid, M., & Ahmad, M. S. (2019). Conceptual Design of a Generic Nodal Abstraction (GNA) for a Human-Agent Collaboration Systems. *IOP Conf. Series: Materials Science and Engineering*, 551. IOP Publishing.

Nassif, M., & Robillard, M. (2017). Revisiting Turnover-Induced Knowledge Loss in Software Projects, *2017 IEEE International Conference on Software Maintenance and Evolution (ICSME), Shanghai, China*, 261-272.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press.

Nisha, R. (2018). Knowledge Management and Recovery Processes using IT: An approach towards Data Mining, *International Journal of Supply Chain Management*, 7(6), 57-60.

Prodan, M., Prodan, A., & Purcarea, A. A. (2015). Three New Dimensions to People, Process, Technology Improvement Model. In Rocha, A., Correia, A., Costanzo, S., & Reis, L. (Eds.) *New Contributions in Information Systems and Technologies. Advances in Intelligent Systems and Computing, 353* (pp. 481-490). Cham: Springer.

Rigby, P. C., Yue, C. Z., Donadelli, S. M., & Mockus, A. (2016). Quantifying and Mitigating Turnover-induced Knowledge Loss: Case Studies of Chrome and a Project at Avaya. *Proceedings of the 38th International Conference on Software Engineering (ICSE '16)*. New York: Association for Computing Machinery, 1006–1016.

Sparrow, J. (2011). Knowledge Management in Small and Medium Sized Enterprises. In D. Schwartz, & D. Te'eni (Eds.), *Encyclopedia of Kowwledge Management, Second Edition* (pp. 671-681). Pennsylvania: IGI Global.

Winkelen, C., & McDermott, R. (2008). Facilitating the Handover of Knowledge, *Knowledge Management Review*, 11(2), 24-27.

Zamani, N. F., & Izhar, T. A. (2018). The Critical Success Factors of Knowledge Repository: A Summary for Future Extension, *International Journal of Academic Research in Business and Social Sciences*, 8(6), 862-871.

Zheng, R. Z., & Dahl, L. B. (2010). *An Ontological Approach to Online Instructional Design*. In H. Song, & T.T. Kidd (Eds.), *Handbook of Research on Human Performance and Instructional Technology* (pp. 1–23). Pennsylvania: IGI Global.

Zieba, M., Durst, S., Gonsiorowska, M., & Zralov, Z. (2021). Knowledge Risks in Organizations – Insights from Companies. *European Conference on Knowledge Management, Kidmore End*, 864.