TOWARDS CENTRAL REPOSITORY DESIGN FOR DOMAIN INTERLOCKING INSTITUTIONAL WORLDS

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ABSTRACT

Interlocking Institutional Worlds (IWs) is a concept explaining the needs to interoperate between institutions to solve common interest in a given domain. Managing knowledge in IWs domain is complex, but promoting knowledge sharing based on standards and common terms agreeable to all is essential and must be established. To support this purpose, establishing a Central Repository (CR) is crucial. Unfortunately, there is a clear gap in designing CR for supporting IWsdomain. The current CR available lacks the capability to support interoperating at domain level. Therefore, this paper attempts to present the gaps that must be addressed to answer why a new CR design is needed to support IWs domain.

KEYWORDS

Central Repository, Inter-agencies, Interlocking Institutional Worlds, Database, Knowledge Sharing

1. INTRODUCTION

The government agencies and the academics have long agreed the importance of inter-agencies collaboration. The rich potential of inter-agencies collaboration has resulted it as strategic imperative for governments to urgently solved pressing issues requiring inter-agencies collaboration. Some of the benefits include (i) reduction in duplication and overlap in programs, (ii) improving and streamlining services to citizens, (iii) potential cost savings and (iv) leveraging digital technologies capabilities. But sustainable and effective collaboration in inter-agencies are very challenging as it involved formal agreements, defined roles and responsibilities, pooled resources, knowledge sharing and shared goals. Studies shown persistent problem such as poor coordination, lack of coordinative decision-making agreement, distributed resources and technology limitation to support knowledge sharing are the things that must be addressed. We focus on central repository (CR) as a platform to store and manage data to support inter-agencies knowledge sharing needs. The question remains if the current CR designs can support inter-agencies requirements.

In discussing Flood Management (FM) domain in relation to inter agency collaboration, we borrowed the concept of Interlocking Institutional Worlds (IWs) as introduced in (Colomb & Ahmad, 2007; Colomb & Ahmad, 2010). The theoretical foundation of the IWs concepts are strongly grounded by the prominent philosophical studies from general theory of Institutional Facts (Searle, 1995) and the Speech Act Theory (Austin, 1962). IWs are collection of organizations interacting together and exchanging information through technologies to achieve common goals in a domain. Among domain cases of IWs include the semantic web, the Olympics, Postal codes, Map preparation and Geographical information governance (Colomb & Ahmad, 2007; Colomb, 2013), flood management (Khanthong, 2018; Khanthong& Ahmad, 2019) and Lesson learned management (Badr, 2016). In IWs, when organizations start to cooperate, a standard and common terminology must be established to enable smooth communication to avoid misunderstanding.

However, there are differences that must be addressed in designing CR for supporting domain like IWs. Most of the CR designs reported in literatures have been designed for a single enterprise and not in the sense of domain IWs characteristics or behavior. Furthermore, most designs were influenced by database (Db) model focusing on data rather than business needs and this introduces heterogeneity issues and the need to establish standards to govern the users' participation.

2. CONSTRAINTS IN INTER-AGENCY COLLABORATION INFLUENCING CR DESIGN

Evidence shows many governments in the world today are moving toward improvements of public sector performance. Government leaders are tasked to find new and innovative ways to tackle long-standing public management challenges. In Malaysia, the government is exploring the possibility to induce collaboration among ministries, departments and agencies to break silos in order to be more efficient and effective (Ramadass, Sambasivan, & Anton, 2018). Studies have addressed why coordination matters and why it is difficult to deliver. Even though there are striking similarities between managing across boundaries and managing within agency, however, working across agencies requires extra persuasion, strict regularized workflow, establish and maintain communication in a network (Roberts, 2011). Studies have drawn similar conclusion that information sharing, and coordination remains at the top of research agenda, despite the progress made over the years. Below we discuss key findings related to this study and how these influence the CR design needs.

2.1 Growing Population that Demands More and Better Services

The responsibilities of government have grown in volume and complexity in tandem with growing population. This has also increased greater separation between the citizens and those who are supposed to serve them. Information and knowledge sharing are important contributions to overcome growing feeling of alienation from the government. With technologies, these demands can be better managed. Therefore, a CR platform design needs to address two main things, that were not considered much in database modelling in (i) people collaboration and (ii) process collaboration.

People collaboration is to allow people across work jurisdiction to use the CR and promote knowledge sharing based on their professional experience around the problem. It could be the single source of truth for collective decision based on lesson learned and to innovate new ideas based on shared knowledges (Fountain, 2001). Process collaboration looks at how the collaboration are effectively managed through operations, strategy and systems where the CR platform design must fulfil those requirements. The CR design must emphasize on clarity of the CR functionality, attract usage and encourage new resource contribution (Fountain, 2001).

2.2 The Problem of Inter-Agency Co-Ordination in Disaster Management

A list of inter-agency coordination issues in disaster management can be compiled but some of the common issues include lack of coordination between various agencies involved (Bealt, Barrera, & Mansou, 2016). This can be seen in the UK King's Cross underground incident in 1987 where it is said that each agency diligently pursued its own duty but there had been breakdown in communication at command level (Fennell, 1989). Disorganized multi-agency response to the 9/11 attacks were as a result of agencies were unable to share information (Jacobson, Ernie, & Lee, 2006). In Malaysia, it has been confirmed on the lack of coordination in disaster management cycle, lack of planning process, imbalanced decision between top-down and bottom-up approaches resulted to low resilience to disasters (Chong & Kamarudin, 2018).

2.3 Evolution of Database - Why do we need Ontology to support IWs at domain level CR design?

Data modelling and Db evolved together dating back in the 1960's. It can be said the Db evolution happened in four waves. Starting with the hierarchical, moving to relational. Next the Online Analytical Processing (OLAP) wave was introduced and the latest was the NOSQL wave for big data and graphs. Each wave comes with its own limitation. The relational Db modelling had struggled with normalization and performance issues. It is reported the modern Db uses schema free approach thus has poor consistency (Phiri & Kunda, 2017).

The Db modelling contributes towards our CR design. However, most Db modelling are meant for single institution approach. Hence, we look at Ontology to fill in the gaps to address inter-agency requirements. Ontology is a formal description of knowledge as a set of concepts and relationship that hold between them. It overcomes Db schemas limitation by being flexible to link multiple concepts to other concepts in a variety of ways.

The benefit of ontology for CR design in IWs includes the main features to address essential relationship between concepts. This is important in addressing domain like IWs to capture the domain knowledge and embrace changes where possible dynamically. Ontology acts like a brain working with reasons the way human perceive interlinked concepts. It provides easy navigation concept through the ontology structure. And in IWs domain it controls standardization and common terminologies to provide understanding between stakeholders. As a result, the model can grow without the constraint of data issue. Ontology can represent any data format including unstructured, semi structured and allows easy data integration, concept, mining, reporting and analytics capabilities.

3. DISCUSSION

Integrating and sharing knowledge is important as it accelerates learning process, improve decision making capabilities, and learn from the past and many more. One of the best options to capture, preserve and distribute knowledge is through a CR. While acknowledging a lot of work has been done in CR design, we believe that some issues are still open in addressing IWs domain like FM and detailed as following:

3.1 Lack of Standards

The purpose of having standard is to establish enterprise-wide standards and guidance for CR usage. These standards must be established and a vital requirement in our CR design as guideline for agencies in participating in the FM repository as to create mutual understanding.

It has been documented that Malaysia faces lack of coordination and duplicating relief efforts issues in current FM system (Centre for Public Policy Studies, 2017). Thus standards must be established and a vital requirement in our CR design as guideline for agencies in participating in the FM repository as to create mutual understanding between the participating agencies.

3.2 Semantic Heterogeneities

Heterogeneities had also been a vital issue in inter-agencies collaboration. Amongst the heterogeneities discussed includes (i) technology difference including hardware and operating system, (ii) difference in data model including structural, constraints and query language and (iii) Semantic heterogeneities (Abdullah, Ibrahim, & Zulkifli, 2017). These challenges must be addressed in order to integrate these agencies in a centralized platform or the issues such as overlap amongst applications, storing of duplication data and misunderstanding in responsibilities will keep on occurring (Tekiner & Keane, 2013).

3.3 Repository for Domain like IWs

Most repositories are tailored towards one organization or institution. Most repository were used to answer one corporation needs. Furthermore, in FM like domain, very little effort can be seen regarding usage of CR to be the integral component. Authorities are still struggling to produce integrated information to meet the domain needs. To the best of our knowledge there is no repository for FM like domain in Malaysia that is available. Most repositories are still silos towards agency's needs. The CR would enable the stakeholders to understand and predict what kind of threat coming their way as agencies can share the platform thus giving a broader perspective

3.4 Available CR are Data Oriented

Today, the demand for organizations to react to business changes to be more competitive and flexible is highly desired thus has called for a platform that able to support business point of view rather than technical perspective (Gao &Krogstie, 2010). We believe the CR design for domains that involves many agencies must be done on domain level and flexible to meet business requirement that is ever changing.

3.5 Loosely Coupled Stakeholders

In an integrated project such as FM, one of the most basic questions is how to get data from the source system. Common practices are using a push or pull method. Data can be pull from the source or the source can push the data to the landing zone. Tightly coupled consists of components that require detailed knowledge between the components be it within the same application or collaborating components. While loosely coupled offers more flexibility as components can stand independently and be more resilient to changes.

4. CONCLUSION

To design CR which tends to be reusable for similar domain is relatively new. This paper inspires to define the gaps in order to propose a new way of CR design for supporting domain of IWs. Designing CR that work at domain level requires a new thinking. In a given domain IWs (such as FM), there is a need to bridge disparate sources of information that exist within the domain. Future studies must be able to define the essential requirements in the design of CR for this kind of domain (IWs).

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