Shaping the Digital Future of Civil Service: An Assessment of Digital Transformation and Data Science Competencies

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***Abstract*—In the era of digital transformation and data proliferation, the need for effective digital competency assessment is increasingly critical. However, existing frameworks often lack comprehensive integration of key digital transformation and data science competencies necessary for roles within the civil service sector. This study introduces a robust instrument to profile competency domains critical to digital transformation and data science roles in the civil service. Leveraging a four-phase mixed-method methodology, including brainstorming, external validation, and a pilot study, the instrument was developed, validated, and tested among 30 state government servants. The reliability of the domains—Data Analytics, Data Science Management, Data & Digital Architecture, and Digital Transformation—was confirmed by excellent Cronbach's Alpha values (0.9). Content validity was evaluated using Lawshe's Content Validity Ratio (CVR) and Index (CVI), indicating strong validity for Digital Transformation and Data & Digital Architecture domains, while suggesting refinement for Data Analytics and Data Science Management. The proposed instrument, validated through self-evaluation scores, illustrates potential for career and organizational development within the civil service, emphasizing its practical value and feasibility.**

***Index Terms*—Digital transformation, Data science, Competency domains, Civil service development**

I. Introduction

The rapid advancement of digital transformation and data science has resulted in significant transformations across diverse industries. The present advances are substantially reforming the provision of government services. The extant literature highlights the crucial significance of proficient data management and digital infrastructure in augmenting operational efficacy within public sector entities [1]. The Sarawak Civil Service (SCS) plays a crucial role in the ongoing evolution of public service delivery, as evidenced by its implementation of the digital transformation and data science profiling project. This initiative seeks to leverage the capabilities of digital technology in order to enhance the effectiveness of public service delivery.

However, the optimal utilisation of data and digital architecture to achieve optimal outcomes remains an area that has not been fully explored. The present body of literature is inadequate in investigating the essential proficiencies that public sector personnel must possess to proficiently handle data within their designated positions [2]. Therefore, it is crucial to conduct an assessment of the digital competency requirements for the professional and managerial cohorts in the SCS to cultivate a civil service infrastructure that is prepared for the future.

This study aims to fill the gaps in the existing literature by examining the essential competencies necessary for effective management of data and digital architecture in the context of government service delivery. The present study is aimed at achieving two-fold research objectives: This study aims to introduce a pioneering approach to digital transformation and data analytics competency mapping, as well as to design profiling instruments that can effectively measure the digital transformation and data analytics competencies of state civil service officers. To achieve our research objectives, we will be utilising a mixed-methods approach.

This rest of this paper is structured in the following manner: Section 2 provides a thorough examination of relevant literature, thereby establishing the scholarly framework for our investigation. In this article, Section 3 expounds upon the research methodology that was utilised in the present investigation. The ensuing sections of this paper centre on the results (Section 4) and discourse (Section 5) derived from the investigation. Section 6 presents a definitive conclusion and deliberates on the implications of our research.

suggestions, specifying whether a domain necessitates further revision or has already attained a level of content validity deemed 'excellent'. This robust evaluation enables a systematic approach to enhancing the precision and effectiveness of the competency profiling instrument. **Data Analytics:** The CVI values for self-assessment and survey are 0.08 and 0.13 respectively. Given that both values are well below the acceptable threshold of 0.6, the interpretation suggests that the items in this domain necessitate further revisions to better capture the intended competency. **Data Science Management:** The CVI values are 0 for self-assessment and 0.1 for the survey. These low values indicate the items in this domain do not adequately represent the intended construct, implying the need for further refinement. **Data and Digital Architecture:** For this domain, the CVI value for self-assessment is 0.66, which surpasses the acceptable threshold, indicating excellence. However, the survey CVI value is 0.42, falling below the threshold. This disparity suggests while the self-assessment items exhibit strong content validity, the survey items may require review and potential refinement. **Digital Transformation:** The domain exhibits high CVI values for both self-assessment and survey, with values of 0.87 and 0.71 respectively. This demonstrates that the items within this domain have excellent content validity, suggesting a successful representation of the intended competency in both modes of assessment.

C. Self-Evaluation Scores

Table V shows the percentage scores accrued in each competency domain from the self-evaluation process. These percentage scores quantitatively reflect the proficiency or performance level exhibited within each respective domain.

TABLE V
PERCENTAGE SCORES ACCRUED IN EACH COMPETENCY DOMAIN FROM THE SELF-EVALUATION PROCESS

Competency Domain	Percentage
Data Analytics	68.00%
Data Science Management	75.00%
Data & Digital Architecture	72.86%
Digital Transformation	81.82%

From Table V, it can be discerned that the participants perceived themselves to be most proficient in the 'Digital Transformation' domain, as indicated by the highest percentage score of 81.82%. This was followed by 'Data Science Management' at 75%, 'Data & Digital Architecture' at 72.86%, and 'Data Analytics' at 68%. These self-evaluation scores provide valuable insights into the self-perceived competency levels of the participants within each domain.

V. DISCUSSION AND LIMITATIONS

The SCS's aspiration to be a world-class civil service underlines its focus on cultivating talent, delivering top services, and fostering a global mindset. The introduced digital transformation and data analytics competency profiling tool helps bridge the current and desired competencies of officers [38]. The tool's highest self-perceived proficiency is in Digital Transformation, reflecting officers' readiness to adapt to the digital era. The Data Analytics domain shows lower proficiency, suggesting a need for capacity building.

The tool's quality, as per the Content Validity Index (CVI), was excellent in the domains of Data & Digital Architecture and Digital Transformation; but needs revision in Data Analytics and Data Science Management. The project proposes a tailored approach to digital talent management, departing from one-size-fits-all strategies and fostering targeted training and growth.

Despite its invaluable contribution to the SCS's journey, the study has limitations including a restricted sample size and potential misalignment between the SCS competency dictionary and current job descriptions. Further, the conceptualization of Leadership and Functional domains slightly deviates from typical literature. Future research should address these issues, potentially broadening the sample and refining domain-job description alignment.

VI. CONCLUSION AND FUTURE WORK

This study demonstrates the feasibility and value of proposed digital transformation and data science competency instruments, highlighting their potential in advancing the competencies of civil service officers. These tools can provide insights for career and organisational development, build a cadre of highly trained officers, aid succession planning, and contribute to achieving strategic objectives within the civil service.

Future work should focus on enhancing the instruments' robustness, aligning leadership and functional competencies with existing literature and service ambitions, initiating a comprehensive job analysis process, and encouraging the adoption of this competency profiling model in other agencies for comprehensive talent development.

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