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Original Article

## A Socially Aware Information System Design Framework for Reformed Government

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Framework. Design  
Process

The process of designing information is complex by nature due to continuous involving landscape of user requirements. At present, it is even more complex in an environment which involve a reformed government setting. The challenges experienced during the designing process if not well addressed may contribute to the ineffectiveness of the information system especially in local government settings. This research observes that the design of information systems for local governments particularly in developing countries is achieved through the implementation and fulfilment of business objectives that are reform minded. Implementing such reforms results in new redefined institutional arrangements, policies, and strategies in the local context triggers changes in the system requirements. However, there is less attention to the analysis of the reforms in a local social context during the process of designing information system. The fundamental aspect of the design outcome is establishing the socially aware relationships in the reformed context to enhance the analysis and design of the information system at the local level. This paper addresses the influence of social context in the process of designing information system and presents the socially aware framework of designing information system in the reformed local government setting.

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## INTRODUCTION

Recently, governments in developing countries have attempted to enhance public service delivery and management. Also, several African countries have engaged themselves in reform programs, including reforming financial management information systems and thus decentralising the local government services (Conyers, 2007; Fedelino & Smoke, 2013; Lokuwaduge & Silva, 2020). As a result, central and local governments design and implement information system at the local level to achieve reform objectives (Zhuo & Zhang, 2022). Tanzania is one of the African countries that have implemented several reforms including financial reforms and control systems from revenue collection to expenditure (Laizer & Suomi, 2017). The process of designing information systems in a reformed government faces several challenges that may contribute to the ineffectiveness of the information system, especially in local government settings (Armstrong *et al.*, 2013; Cordella & Iannacci, 2010). In this paper, reformed government refers to changes made to a government system's structure, policies, or practices to address perceived flaws, improve efficiency, or promote greater accountability and representation from local level (Fjeldstad, Chaligha, & Braathen, 2008).

The government reform implementation was emphasized by the international organisations such as World Bank, and International Monetary Fund (IMF) (Laizer & Suomi, 2017). The strategy of the reform is to encompass policies that centrally influence the process for implementing information system to ensure accountability, efficiency, and transparency within local government setting. The technical goal was to ensure that implementation of information systems increases quality and service coverage in the public sector including local governments. However, the implementation of reforms in the local government is often associated with issues

of changes and the complexity of local government interactions with several sector policies, strategies, and guidelines. Other social changes includes context, process of doing work, power relations, and stakeholders interactions. This attracted the academic, policy makers, and practitioners' attention towards the designing of new systems in developing countries. As suggested by Malodia *et al.* (2021) that an understanding of these social changes as prerequisite for the process of designing information systems is critical in covering the design actuality gap in local context.

Literature points out that the design of information system in a reformed government setting is a complex process especially when covering social aspect. Hashim and Piatti (2018) explain that government reforms are aimed at promoting changes and improvements to the structure, functions, and operations of the government systems. This led into complexity of technical, organizational, and political perspectives thus impacting the process of designing information system (Armstrong *et al.*, 2013; Cordella & Iannacci, 2010; da Costa Junior *et al.*, 2019). The outcome and objective of government reforms have suggested that an impact on political and social dimensions in the government are different from those in the ordinary private sector (Hashim & Piatti, 2018). For instance, the implementation of financial strategic reform objective resulted in the development of functional and economic codes following internationally accepted classification schemes and aligning to International Public Sector Accounting Standards (IPSAS).

The reform initiatives may require data sharing, collaboration, and coordination among various actors, and systems, which can be complicated due to technical, organizational, and cultural barriers (da Costa Junior *et al.*, 2019). This highlights that a comprehensive framework for socially aware information system design in the

reformation context such as for local government is critical. The comprehensive socially aware framework is necessary for incorporating all the necessary perspectives such as technical, organizational, and cultural perspectives in a socially minded government reform. This study addresses and assess how the context, power relations, institutionalised procedures, knowledge, and interactions as social factors influence the process of designing information and develop a socially aware information system design framework to enhance the understanding of the social determinants of designing information system in a reformed local government setting.

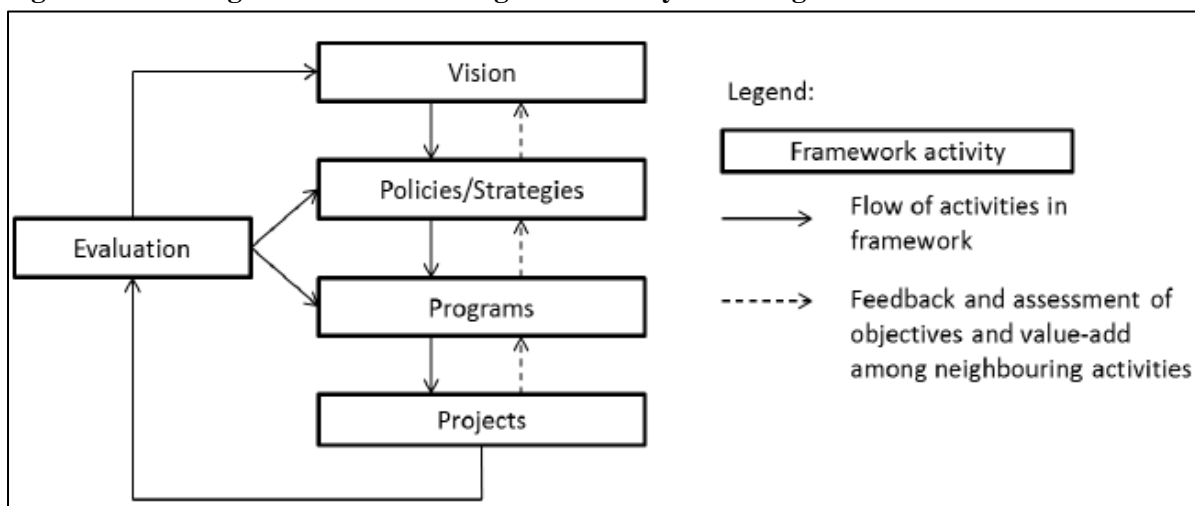
**EXISTING FRAMEWORK FOR THE DESIGNING OF INFORMATION SYSTEMS**

The reformation of information processing is also catalysed by various reforms implemented in government settings, one example being financial control. For enhancing information process, implementing information systems was inevitable to explore the optimal utilization and generation of information for performance of government related functions (Chaulagai et al., 2005). Research has shown that governments in developing countries have taken great effort towards the designing and implementation involving government environment to enhance work practice effectiveness, responsiveness, and efficiency in service provision at local context

(Choi & Chandler, 2020). These initiatives align with the development of several frameworks that help analysts and designers with the choice of technological innovation and process of designing information system in the government (Isagah & Wimmer, 2018). To enhance an understanding of different representative frameworks in the literature, we reviewed the existing framework for designing information system in governments.

Mkude and Wimmer (2013) developed a strategic framework that emphasizes the relationship and feedback between the series of identified activities while designing information systems for the government projects. The identified activities are as such as (1) developing a vision, (2) developing policies and strategies, (3) introducing programs for implementing strategies, (4) running concrete projects, and (5) evaluating the achievements of projects towards strategy and vision. In this framework strong aspects as far as design of information system in government reform include the relationship between the government vision and their respective changes in policy and strategies. However, this framework lacks or ignores some necessary aspects such as assessment of organisation norms, rules, and institutionalisation of new procedures that must be considered when designing an information system for government undergoing reforms in developing countries.

**Figure 1: A strategic Framework for e-government system design**



Source: (Mkude & Wimmer, 2013)

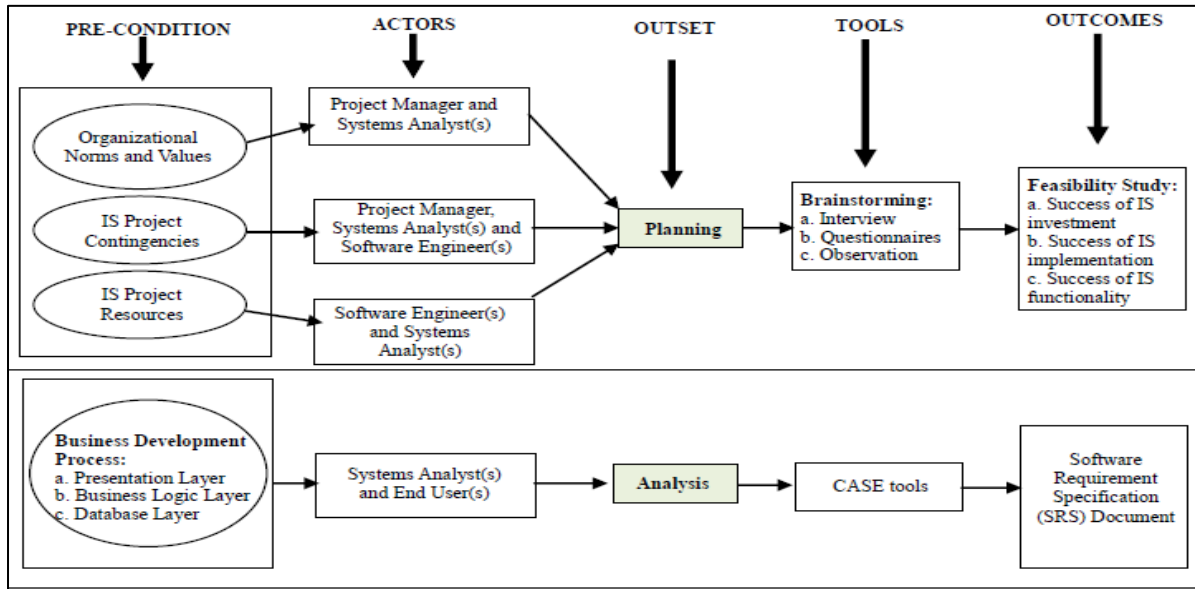
Nyansiro et al. (2021) developed a goal-oriented framework based on the requirement engineering analysis which can be applied for designing information system for reformed government. The development of this framework uses design sciences techniques to analyse the design and its relevancy for the intended information system. The framework incorporates three viewpoint models: e-government model, e-government goals model, and e-government requirements engineering process model. In the E-government goal model, the strategic goals are set and designed as a reference model for eliciting hard and soft goals elaborated into sector-specific systems. E-government model build based on already identified strategic goals, therefore, strategic organisational and technology management for value adding services, information, good governance, support, and administration viewpoints are set to reflect strategic goals. Finally, the requirement engineering process model combines both the e-government and goals model to facilitate the requirement analysis process through stakeholders' analysis, strategic viewpoints analysis and e-government information system module analysis. The framework focused on facilitating the discovery and specification of adequate and relevant requirements while designing Information system. However, this framework lacks or ignore some necessary aspects from the structural changes and power relation perspectives which is context specific and are important aspect in the process of design information system for government undergoing reforms in developing countries.

Philip et al. (2010) developed that framework for designing information system within a specific organisation. The framework is design on an

understanding that information system development consists of the organisation norms and values, contextual factors, and available resources given to the particular project for innovation. The framework is design on the assumption that the outcome of the functionality for the desired information system is based on the investment of the process for business development, development of information system, and process of procurement as illustrated in *Figure 2*. This framework strongly makes an emphasis on how pre-condition assumptions influence the actors' understanding of the business processes, which could trigger into quality system planning, which is an important aspect of the process of designing information system. However, it does not clearly show the actor-network and how could government reform influence these actors' network towards the information system functionality features. In addition, in the reformed government how could the reform institutionalise the norms and values of an organisation in the design outcome is the question that remain elusive. Furthermore, government reformation requires careful planning, resource availability, and country-context (Mkude & Wimmer, 2013; Mkude & Wimmer, 2015).

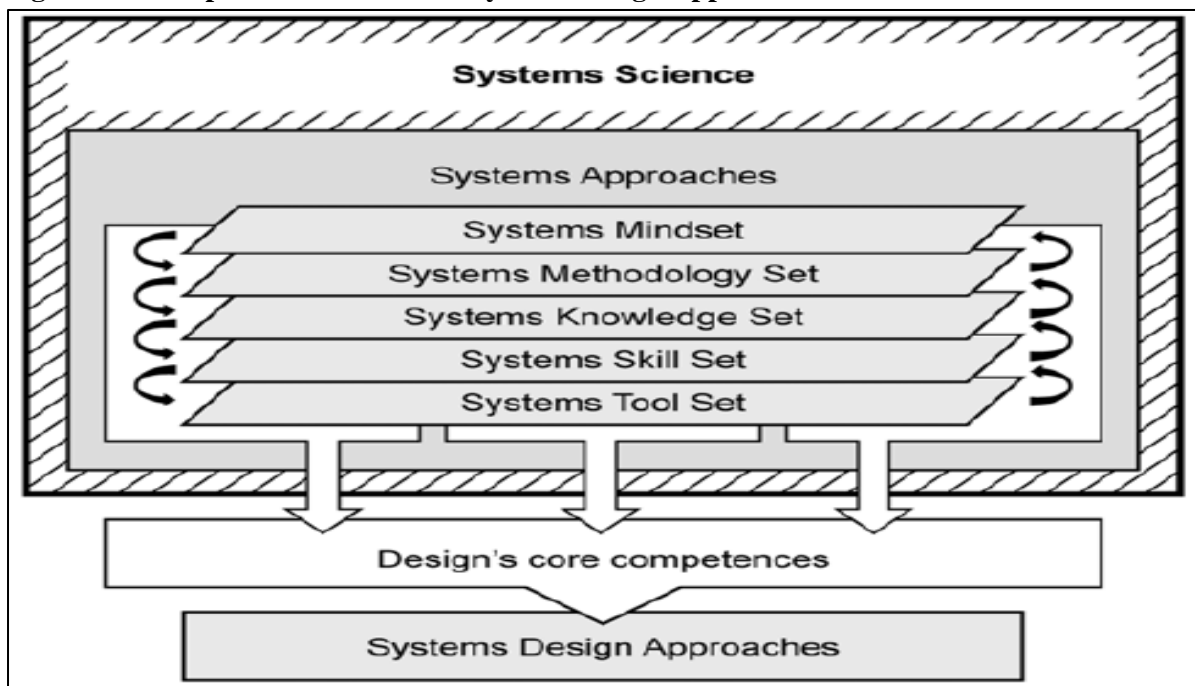
da Costa Junior et al. (2019) developed a framework for selecting an information system design approach. The framework is developed to guide designers with an integrated system thinking in designing an information system when handling complex societal problems such as technical, organisational, social, and political perspectives. The framework is structured in five main clusters (illustrated in *Figure 3*): mind set, methodology set, knowledge set, skill set and tool set.

**Figure 2: Conceptual framework for enhanced information systems development**



Source: (Philip et al.(2010))

**Figure 3: Conceptual framework for Systems Design Approaches**



The framework is developed on understanding that integrating thinking and design are driven by the mind-set changes known as paradigm shift to bridge the compatibility between the mutual interest in social technical systems and complex problem solving. In this framework, three layers of mind set change, knowledge, and system skills play a great role in selecting appropriate approach for designing information systems in the government. However, the framework does not

exactly tell the selection of the approaches in the government undergoing reformations such as how change in structural settings may influence the selections of the systems approaches which may reflect the values of an organisation.

In summary, the presented framework demonstrates various approaches and strategies in designing information systems. However, they lack some specific contextual issues related to reformation process within government and



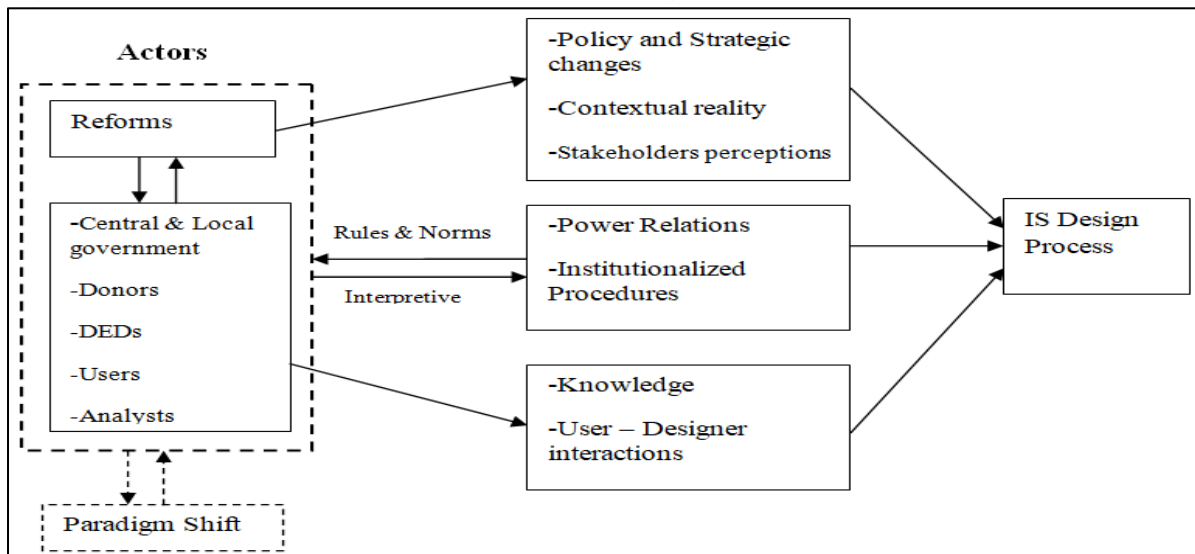
specifically in developing countries. Among specific context issues associated with government reforms are change in structure such as institutionalisation of new processes, policies, and strategies, and changes in power relations, organisational norms, and values, actors, and management schemers (Philip et al., 2010). Furthermore, context issues include collaborations and perceptions from different stakeholders, interaction, and knowledge and skills from user (Hashim & Piatti, 2018). Although the identified frameworks describe some factors separately, such frameworks do not emphasise the relationship and influence of these social factors due to implementing the government reform objectives. As explained by da Costa Junior et al. (2019), social issues mostly bring complexity of technical, organisational, and political issues, thus bringing challenges in designing an information system in local context. It is against this background that the social aware process of designing an information system in government has received this study's attention. In the next section of this paper present the proposed socially aware information system design framework incorporating the changes due to

government reform implementation in developing countries.

### A SOCIALLY AWARE INFORMATION SYSTEM DESIGN FRAMEWORK

The interpretivism approach was used to make analysis presented in the previous section. The framework for socially aware information system design presented considers that context is vital for knowledge, which enhances our understanding of the existing reality through experience, which is an important assumption of the interpretivism approach (Kivunja & Kuyini, 2017). This approach informed our understanding of social determinants of designing information systems in local government settings with Tanzania as case study. The study has observed that eight determinants were critical in shaping the process of designing information systems in a reformed government as illustrated in *Figure 4*. These are; policy and strategic changes, contextual reality, stakeholders' perceptions, power relations, new institutionalised procedures, knowledge, user-designer interactions, government reforms, and paradigm shift.

**Figure 4: The socially aware information system design framework**



#### Actors' Network Influence on the Design of an Information System

The process of designing new information systems typically builds from the organisational structure and procedural changes implemented

during the reform objectives. As described by Philip et al. (2010), information system development teams consist of heterogeneous actors namely systems analysts, business analysis, designers, users, other stakeholders such as

government, donors (World Bank and IMF) (see *Figure 4*). These actors involved must intensively interact with one another as shown in *Figure 4*. As the result there are heterogeneous actors network formed during the process of designing information system. Furthermore, there are a set of activities that should be performed during the process of designing information system enhancing the alliance of interest among actors (Philip et al., 2010). The actor network activities are designed based on the government reform objectives. These activities are assigned to systems analysts, designers, users, and other stakeholders to ensure smooth development of the system. The primary goal is set through reform, which the actors must spelt out in the requirement specification document. The proper management of the reform objectives starts from the managerial activities at management level through user level. In designing information system, actor's network explicitly encompasses the development process from planning to maintenance stage.

### **Paradigm Shift on Influence on the Design of an Information System**

This study observed that the information system design process involves internally and externally heterogeneous actors (see *Figure 4*). These actors need to align their interest and enhance their mutual understanding towards implementing the reform objective (Stanforth, 2006). Therefore, this study further observed that actor-networks are constructed under the influence of reform implementation. Several changes like business rules, policy and strategies, and work practices are implemented during this stage. Thus, the paradigm shift emerged as an essential aspect to motivate heterogeneous actors to accommodate and implement new information system transformations (da Costa Junior et al., 2019). This indicates that paradigm shift construct during the process of designing information system in local government setting is critical aspect. This is based on the idea that the fundamental change in local government assumptions also triggers the understanding of actors about the changes envisioned.

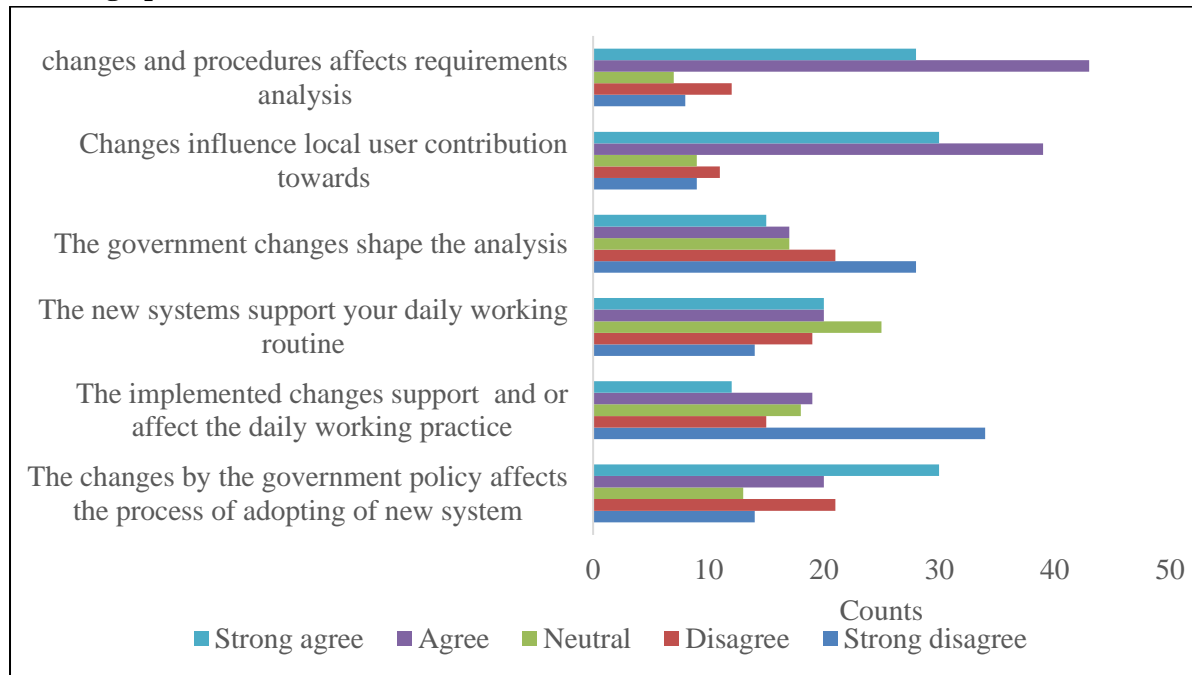
The presented framework further illustrates that actor's network may influence the change in policy and strategies, stakeholders' perceptions, and understanding of the reality of the context. Therefore, the constructed network allows the interplay between heterogeneous actors (such as central and local government, donors, users, and analyst) and reforms which institutionalise new constructs such as rules and procedure, power relations and resource management within an organisation which is explained by an interpretive scheme. Therefore, paradigm shift shall allow the actors or stakeholders to simultaneously address changes to employees and policymakers to satisfy the local government's better needs, enhancing internal and external stakeholders' alignment. This relationship may also influence the information system design process in local government settings.

### **Policies and Strategies Influence on Design of an Information System**

This study has observed that the strategies and organisational policy influence the information system design process at the local government level. As shown in *Figure 5* that the change support, change in processes and work practice, and strategic objective are important factors influencing the process of designing information system at a composite mean of 3.20. This is supported by the government ICT policy in Tanzania which emphasizes that participation, partnership, and collaboration enhance the information system implementation process in public sectors (URT, 2016). This is also supported by Bakar, Talukder, Quazi, and Khan's (2020) that government policies and subsidies are critical in encouraging the implementation of new technology and thus push to designing and implementation of information system. However, the current approaches for designing information systems do not explicitly represent the local business strategy in terms of the operational and functional aspects of the local government level. The implication is that analysts and users at the local level face difficulties in validating systems requirements with local government business

strategy as well as against the management and stakeholders` intentions.

**Figure 5: Perception of respondents on changes of policy strategies on government reform during the design process**



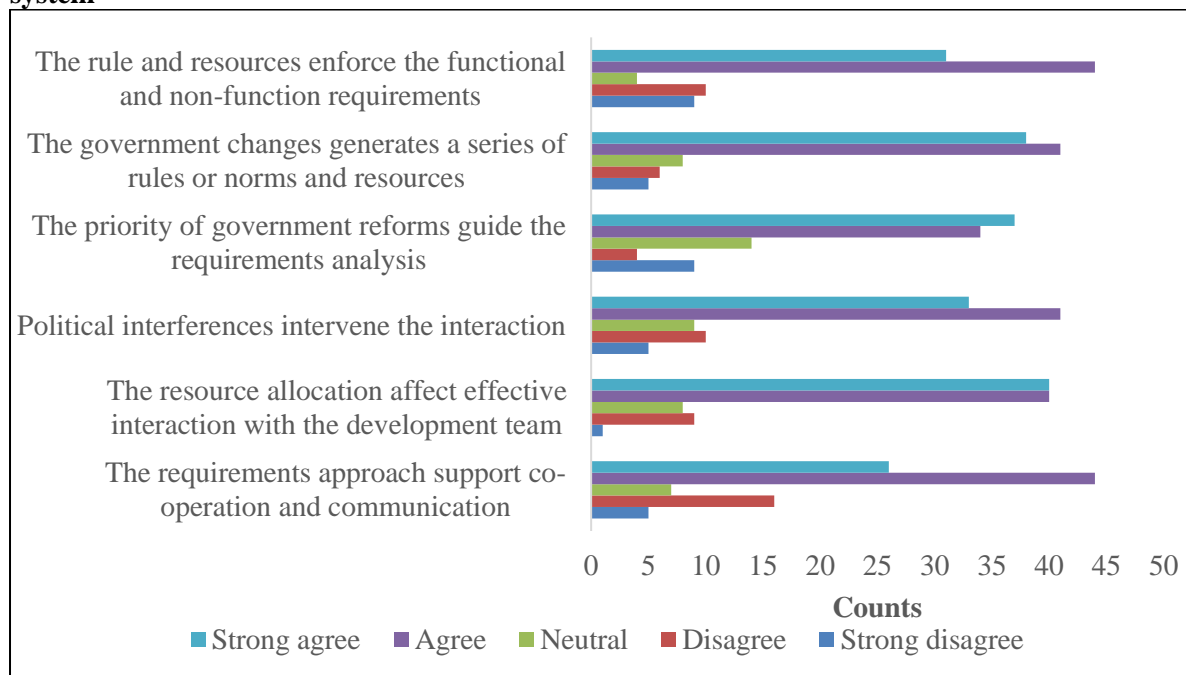
**Power Relations Influence on Design of an Information System**

Power relations resulting from authority such as the central government, political intervention, and limited resource sharing among different leadership hierarchies is the factor for information system design in local government settings. Concerning power hierarchy, it has been observed that key actors do not produce and reproduce rules, norms, and resources but they further can shape the designing process in the local government setting. This indicates the ability of local users and leaders to tap the available power to establish favourable relationships in producing and reproducing local activities to feature the

central government objectives. As presented in *Figure 6* factors such resource allocations, priority of government reforms, and political pressure. It has also been observed that power relationship is created through the structure of the reformed local government setting and might influence the design of information system. The structure describes how roles, power, and responsibilities are assigned to each employee and how such aspect can affect the information system design process in a reformed government setting. These responsibilities and roles are embedded with some elements of power to manage and control subordinates and their activities during the design process including the requirement analysis plan and strategy.



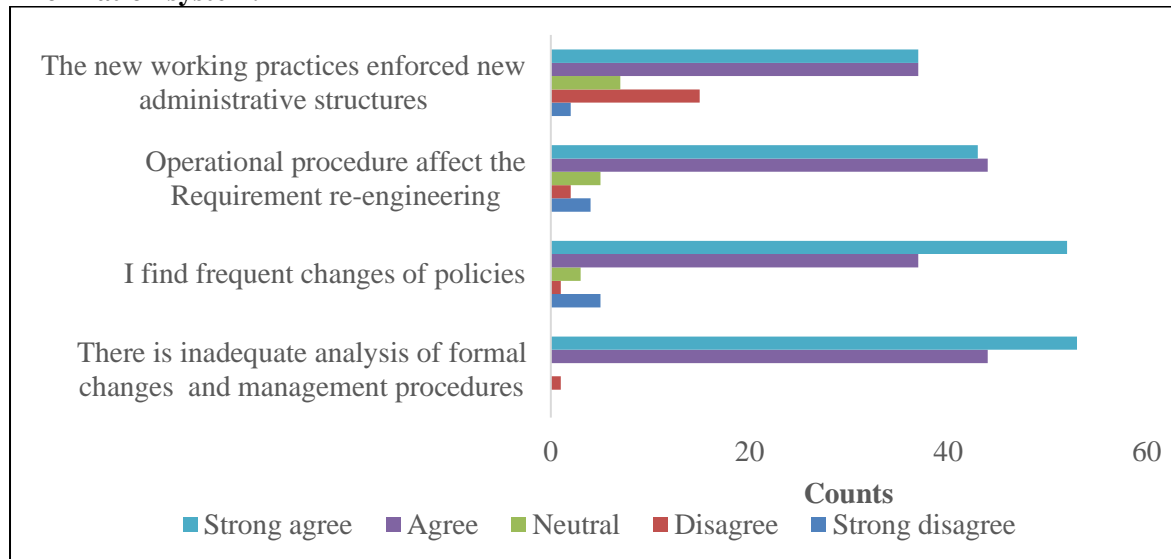
**Figure 6: Perceptions on the effects of power relations during the process of designing information system**



**Institutionalised Procedures Influence on Design of an Information System**

Institutionalized procedures and arrangement are explained from structural perspectives as the administrative rules, laws, norms, and conventions that organizations use to legitimize, coordinate, and regulate the actors' actions and expectations (Nurdin, Scheepers, & Stockdale, 2022). In the presented framework it is illustrated that the work practice and procedures, behaviour of an organization, and interactions during the process of designing information system is also shaped by institutional arrangements (Abdelnour

et al., 2017; Nurdin et al., 2022). These procedures as emphasized by structuration theory are rules and regulations, legitimacy, and standards defined by the structures (Iyamu, 2021). This study has revealed that the legitimacy and institutionalised procedures are enacted when reforming government settings (see *Figure 7*). In this knowledge, an organisation's behaviour, practices, and patterns of interactions within the technological field are often governed and shaped by institutional arrangements (Abdelnour et al., 2017) and thus has potential to influence design of an information system.

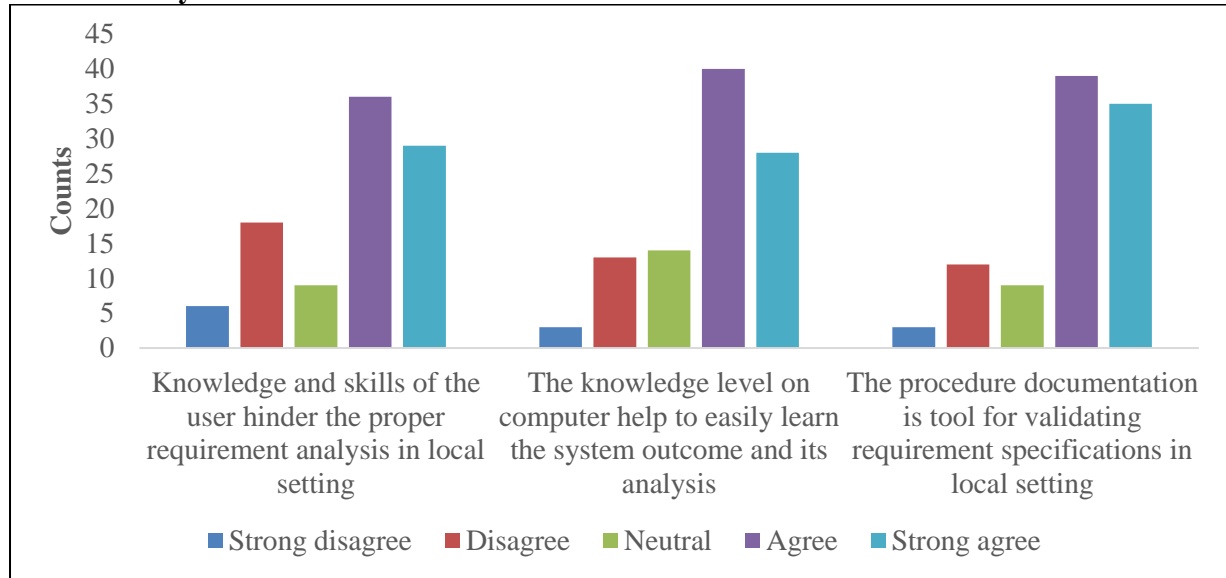
**Figure 7: Perceptions on effects of new institutionalised procedures on the process of designing information system.**

### User Knowledge Influence on Design of an Information System

Knowledge of actors and designers was also found to be one of the factors that influencing the design process of information system design process at the local level. This means the knowledge can impact the outcomes of the information system design process. The presented framework shows user's knowledge and the extent to which users trust other stakeholders' knowledge such as knowledge of analysts has a significant role in designing the new information system (Dahl & Svanæs, 2020). The study has revealed that local users sometimes present personal interests to be incorporated in the design which contradicts the best practice in public sectors. Interpretively, it has also shown that the gap between local users and other stakeholders (like analysts and other

leaders in hierarchy) isare due to different knowledge and experience. This implies that users cannot sometimes explain exactly what functions they want from the information system concerning their need. Users need to be exposed to and remain aware of what the information system can do for them so that they gain confidence in what they can explain as their requirements and feelings. As further observed from this research, the local user knowledge on the information system design in local government setting supported smooth learning of the system outcome and its analysis. As shown in *Figure 8*, having low knowledge in handling information towards the design of new information system outcome hindered the quality and requirement analysis and specification tailored to specific communities' needs.

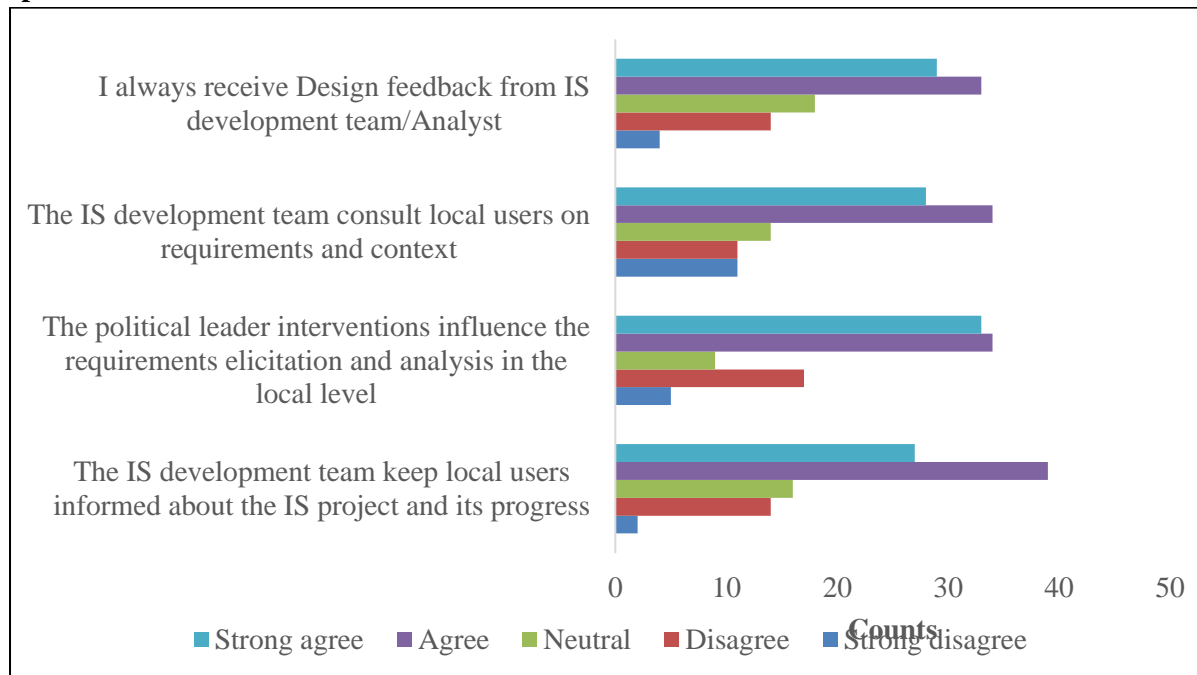
**Figure 8: Perception of respondents on the effect of user knowledge on the process of designing information system**



**User–Designer Interaction Influence on Design of an Information System**

This study has observed that responding to the meaningful interactions between users and designers during the process of designing of an information system will address the questions of what, and how the local users’ perspectives and relevant values become embedded in the outcome of the design of information system for the reformed local government settings. The reality gap in the context of reformed government can be observed when the system analysts failed to effectively analyse and integrate local user’s queries in the design. This study further observed that the complexity of the local government environment has also been a big challenge to interaction process, eventually impeding the analysis and design process (see *Figure 9*). As depicted by Park and Park (2014) and Park and

Ramaprasad (2018) that interactions allow the worldviews from the important stakeholders to be incorporated and aligned with the government-defined objectives, values, and motivations from a local user perspective. Thus, in the socially aware context the presented framework encourages an understanding of the government reform objectives and actors’ networks which could enhance the degree of interaction between local users and systems analyst at local setting. As further shown from *Figure 9*, the management at local government level was found to influence the interaction and engagement of the analysts and developers with local users while designing information systems. The District Executive Director as a district management influenced the process by preparing and sending official documents to the information system development team which was incorporated accordingly.

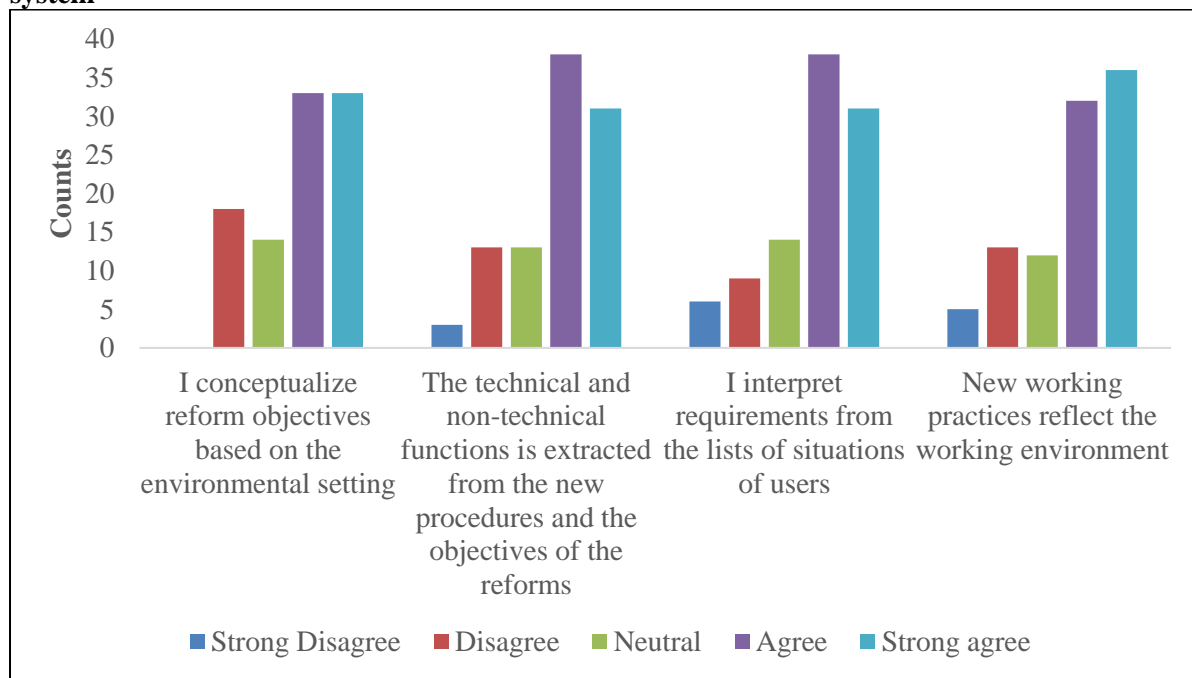
**Figure 9: The extent of interaction with designers during the requirements analysis and specifications**

### Contextual Reality Influence on Design of an Information System

This study has further observed that there is an existence of a gap between the perceptions of the process of designing information system and the reality of local content. This reflects the context in which local level decentralization was introduced as part of reform objective. Researches have established that several systems have been implemented when the government undergoing reformation, particularly in developing countries, to achieve reform objectives (Conyers, 2007; Fedelino & Smoke, 2013; Mbelwa et al., 2019). This indicates that government reform objectives mainly focus on the structural change dimensions in terms of decision-making, responsibilities, and resource allocation from the central government, which in turn affects the process of identifying information system opportunities and strategic definitions from the local level. This highlights that the importance of context in designing an

information system begins with understanding the phenomenon in terms of the local government practices and stakeholders' interests (Atinaf, Anteneh, & Kifle, 2023). Hoffmann, Bittner, and Leimeister (2013) further recommend that context enhances the understanding of the domain knowledge which increases the mutual understanding among the local users. This will influence the shift from old into new perceptions among local actors in both central and local government. This study further observed in *Figure 10*, that contextual reality influences technical and non-technical functional requirements from the local context, and new working practices are considered to be well aligned with the working environment. In particular, reform implementation was also found to affect the context whereby changes of some processes within institutions may also influence attitudes towards the design of information systems in local government settings.

**Figure 10: Perception on the effect of contextual reality on the process of designing of information system**



The overall implication of this study is as presented in the framework in figure 4 that government reforms in developing countries contributed in shaping and re-shaping of the changes in policy and procedure of doing work in the local setting. Consequently, the networks among actors were constructed to align interest towards the process of designing information systems for local governments. Therefore various information systems were implemented to ensure accountability, efficiency, and effective management performance which are relevant to the objectives of government reform. Another interesting finding as the result of reform implementation is that, it enhance the stakeholders understanding of the local context and within the reform focus. This in effect, resulted in better integrated requirements specifications and priorities coupled with better informed reform decision in local governments of developing countries. Generally, the study have implications for the process of designing information systems through the use of socially aware information system design framework in local government context, while assists policy makers, and practitioners in making better informed strategic decisions for improving the process of designing information system.

**VALIDATION OF THE FRAMEWORK**

The Delphi technique was employed in validating the framework. Delphi technique was selected because it allows to gain consensus through opinions from a group of experts. In addition, the technique was suitable for validation of this framework since it allows free expression of opinions provided by experts (anonymity), also the expert may change their opinions based on their perceptions and understanding (iterations), experts are further informed about views of other experts participating in the study (controlled feedback), and hence form mutual statistical aggregation which allow a quantitative analysis (Profillidis & Botzoris, 2018).

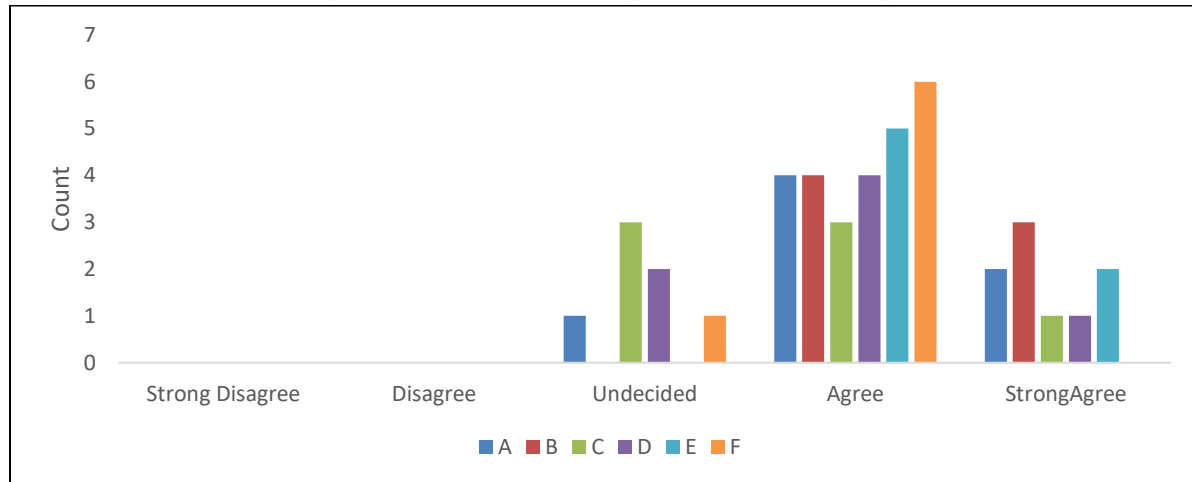
A validation was done through a team of seven experts who are working as the analyst and developers in the President Office Regional Administration and Local Government (PO-RALG). The sample size was established base on recommended range of 5 – 30 experts that can give good consensus results (Chalmers & Armour, 2019; Ogbeifun et al., 2016). Convenience sampling technique (Stratton, 2021) was employed in selecting experts and developers from PO-RALG to constitute a team of expert. The experts were involved in the two rounds of



online questionnaires. The selected team experts were assigned the dummy names E1, E2, E3, E4, E5, E6, and E7. According to Filyushkina et al. (2018) the five-point Likert scale questions were developed to measure the level of agreement

among expert teams. The Likert scale questions was defined in the following level 1= Strong Dis-Agree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly Agree as analysed in *Figure 11*.

**Figure 11: A summary representation of scale response from seven experts**



This study, consider 75% score as the minimum percentage of agreement among the expert as the highest acceptable threshold category level (Gallotta, Garza-Reys, & Anosike, 2018). The Delphi study threshold level is described as greater than one half (more than 50%); three fifths (60%); two thirds (66%); or three quarters (75%) (Gallotta et al., 2018). After the first round, feedback from the expert’s participants was incorporated in the new frameworks, led to improvement of the second-round consensus threshold to an average rating score of 4.01, equivalent to more than 80% of agreement with the framework items (See *Table 1*). This high

threshold level of consensus indicates that all eight construct items form a socially aware information system design framework in local government perspectives. The items in the framework are suggested to be considered by policy makers, and analyst during the process of designing information system in the reformed public administration like local government authorities in Tanzanian context. The framework also enhanced the understanding of the determinants of information system development process in the government undergoing reformation.

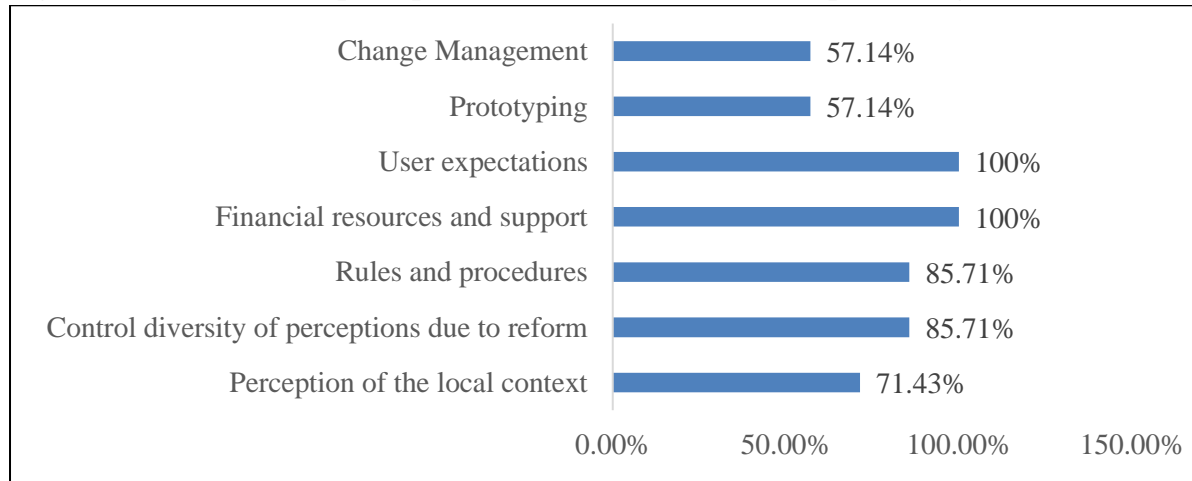
**Table 1: The response of the Delphi technique from information system design experts.**

S/N	Item Descriptions	Mean	%
A	The applicability of the framework can enhance the information system requirements and analysis process in local government setting.	4.143	82.86%
B	The framework constructs (i.e., new institutionalized procedures) stimulates the information system analysis and design process in local government	4.428	88.56%
C	The framework can motivate the local context realization of the government reforms objectives during the Information system design process	3.714	74.28%
D	The framework application among local users and experts enhances the new thinking of the information system requirements approach and hence motivates the fundamental changes of norms, regulations, and business process.	3.857	77.14%
E	If the framework is adequately applied during ISD process can help to facilitate the local user participation process in local government setting	4.286	85.72%
F	The application of the framework can improve collaboration, cooperation, coordination, and information sharing between government agencies	3.857	77.14%

This study further observed other scattered expert opinions regarding implementing the framework and its applicability in the reformed local government setting. These are perceptions of the local context, control diversity of perceptions due to reform, rules and procedures, financial

resources and support, user expectations, prototyping, and change management. The level agreement among experts during the government reformation and the process of designing information system are as presented in *Figure 12*.

**Figure 12: Summary of expert opinions to be considered when implementing the framework**



**CONCLUSION**

This study presented a socially aware framework for designing information system which contribute seven important social constructs to be considered while designing information system in the context of local government. The proposed framework provides a guide to address the design challenges in reformed government. Furthermore, the framework provides an opportunity for local government to design and implement user-friendly information systems that cover organizational process changes per reforms objectives. The Delphi technique was employed to validate the socially aware framework which was found to inform the policy makers with an insight of the design activities in the reformed government setting. Future research should test and improve the proposed socially aware information system design framework and improve the framework to address other possible constructs that emerge due to reform implementation in local governments of developing countries.

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