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Application of Multi-Criteria Decision Making (MCDM) Tools in Governance Evaluation of Accessible and Inclusive Urban Developments (AIUD)

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Abstract

This research posits that the issue of accessible and inclusive developments (AIUD) is perhaps one of the most discussed and researched subjects under the broad rubric of sustainable urban developments. AIUD are developments that ensures accessibility for and inclusion of persons with disabilities in all aspects of developments and follow universal design approach by removing barriers to the physical environment, transportation, employment, education, health, services, information and assistive devices such as information and communications technology (ICTs) to achieve fullest potential and dependency for all society members. In spite of the vast focus of discourse and practice or policy on AIUD, a major concern and rationale for this study is the poor or inadequate evaluation of AIUD governance evaluation, due primarily to lack of coherent, standard and applicable evaluation tool. AIUD is known as a dynamic complex environment involving multi sectors and multi stakeholders which leads to challenges for decision makers in successful implementation. Therefore, this research propose research methodology for developing a

governance evaluation model for AIUD using Multi-Criteria Decision Making tool (MCDM) to rank performance and prioritize improvement actions. Further studies will follow this research to fully develop the model according to the proposed research methodology.

Keywords
Governance, Evaluation, Accessible and Inclusive Urban Developments, Disability and Multi-Criteria Decision Making.

1. Introduction

The world is growing dramatically from all dimensions. Changes are occurring rapidly allowing very little time to understand the world's complexity and to prioritize the wicked problems that challenge implementing sustainable urban developments. Countries around the world are striving to contend with issues of fair distribution of resources and ensuring equal rights for all citizens. However, in spite of efforts by Governments and, in many cases, civil societies, there is clear evidence of social discriminations among different social groups in terms of access to resources and public facilities. Social inclusion, which is a human right and a core pillar of sustainable development, continues to elude certain groups in the society, including, and especially, persons with disabilities and the elderly (World Report on Disability, 2011). The interest of this research is in these two groups of people.

According to the World Health Organization (WHO) and World Bank (WB) in 2011, statistics show that over a billion people, which forms about 15% of the world's population, live with one type of disability or another (World Report on Disability, 2011). In addition, by the year 2050, it is expected that there will be 147 Million people over 60 years who are subjected to decline in their physical and mental capacities In light of the plight of the disabled and the elderly, the United Nations has called for implantation of AIUD and encouraged collective efforts to be utilized by the public sector, the private sector and NGOs to implement international obligations and ensure successful achievements of AIUD.Social exclusion is one of the most challenging social problems, especially in modern society. Besides, resolving social problems is challenging because successful policy integration can be achieved only through goal alignment strategies for all stakeholders so all actors will perform as one system (Mu and Jong 2016; Uyl and Driessen 2015; Stewart 2006; Haarich 2018).

At all levels of government and indeed in cities worldwide, there is no shortage of policy and verbal commitment by governments to the ideals of social inclusion. Evidence of substantive commitment can be found, through legislation, resource allocation and programs, to pursue social inclusion. In most of these cases, what this research finds missing or inadequate is a clear, systematic and strategic tool for evaluating governance performance. The United Nations has acknowledged the challenges faced by many countries in urban planning leading to inadequate access to public services, infrastructure and technologies. The weak implementation of AIUD has led to equity issues that affect quality of life and the implementation of sustainable developments goals. One of the main reasons faced by AIUD is due to its complexity and involvement of multi actors from different sectors (public sector, private sector and NGOs) in addition to various fields (urban planning, policy makers, Engineering and social sciences). This issue impacts persons with disabilities and elderlies in particular but its impact extends to the society as a whole since the target group forms 20% of world population and they are effective members of societies.

Governance evaluation has been used in the literature and in practice to address different fields with complexity nature and high uncertainty. In addition, it has various applications in the field of multi sectoral and multi stakeholders such as transit oriented developments, protected areas and environmental field (Antunes et al. 2009; Mu and Jong 2016; Haarich 2018). The reason why governance evaluation has been applied in literature and practice is because that conventional quality assessment and excellence models have un satisfied results when applied to service delivery of wicked problems (Bovaird and Loffler 2002; Bovaird and Loffler 2003). Therefore, the quality assessment models were widened to the concept of governance and proofed its success (Bovaird and Loffler 2002).

While governance indicators have been used to evaluate and compare performance internationally and to promote citizens participation (Stewart 2006), governance indicators have been also used for assessing quality of governance to demonstrate performance and identify needed improvement (Lockwood 2010). There are many references in the literature that recommended and used MCDM tools to develop governance performance evaluation models as MCDM tools are efficient in complex environments especially when it comes to sustainable development issues (Antunes et al. 2009; Uyl and Driessen 2015).

This research explores literature for application of governance evaluation and the use of MCDM in order to extract and synthesize elements of existing evaluation models into a proposed bespoke governance performance model for AIUD through various phases of research milestone. The result of this phase of research is a proposed research methodology for model development.

2. Literature Review

2.1. Governance evaluation

Bovaird (2005) stated that governance has emerged recently in public domain as a key concept although it embraces concerns that are age-old. The evolution of governance in literature and practice have motivated utilizing its theory and principles in resolving wicked problems and issues involving multi sectoral and multi stakeholders. Therefore, the development of the body of knowledge in governance among different fields, have created wide variety of information depending on the field of research and area of application. In the literature, governance has been addressed by different fields of research and this diversity of confrontation has given the concept of governance a wide range of exposure to perceptions. Therefore, there is no agreement on single definition of governance but most of the definitions agreed that governance is a process. Ehler (2003) has defined governance as *"the process through which diverse elements in a society wield power and authority and, thereby, influence and enact policies and decision concerning public life and economic and social development"*. Bovaird and Loffler (2003) has defined good governance as "the negotiation by all the stakeholders in an issue (or area) of improved public policy outcomes and agreed governance principles, which are both implemented and regularly evaluated by all stakeholders".

2.2. MCDM tools

MCDM tools are used to assist in making rational judgements when it comes to complex problems with multi criteria and multi alternatives. The selection of the most applicable MCDM tool depends on the nature and characteristics of decision problem. MCDM have a wide range of applications in different fields to resolve complex issues both in literature and practice (Sanga et al. 2013; Saaty 2008). MCDM tools can be applied to rank criteria and alternatives and determine criteria weights to evaluate performance. The strength of Analytic Hierarchy Process AHP is driven by its reliability, ease of programming, simple input and efficient processing which makes it a first choice for many Large international corporations.

AHP is a MCDM tool that represent a problem in a hierarchic structure then uses pairwise comparisons to establish the relations within structure. Saaty (1987) has recommended using AHP in both physical and social domains and he recommended AHP to resolve societal problems and stated that "In general a hierarchical model of some societal problem might be one that descends from a focus (an overall objective), down to criteria, down further to sub criteria which are subdivisions of the criteria and finally to the alternatives from which the choice is to be made"(Saaty 1987). AHP applications via variety of business models reflects its flexibility to be adopted in different environments for different perspectives. In addition, AHP has been used for group decision making and it can accept both qualitative and quantitative input. Moreover, it is now forming a significant element of decision making literature and has been increasingly used in academic curriculums and research. Also, due to the rigidity of the mathematical model, AHP is considered to be a one way process and it requires a re-processing of the entire model if the input is changed. However, this challenge has been mitigated with the AHP being easily programmable tool so that eliminated the efforts generated by the re-processing action. As all other tools, AHP is dependent on the human perception input and since its being used for group decision making, then the reliability of its outcomes depends on the consistency of the input. Therefore, the more the input is filtered and appraised the more the quality of the outcomes. It is highly recommended to integrate other tools and course of actions to generate criteria elements and alternatives at the same time, AHP has been used to serve as a tool to filter inputs to other decision tools. This approach is considered as a best practice by which a selection of decision tools are used as a tool kit for decision makers to form a sustainable decision making tool.

Saaty (2005) defined Analytic Network Process (ANP) as a generalization of the Analytic Hierarchy Process (AHP), by considering the dependence between the elements of the hierarchy and represented in a network unlike AHP which is represented in hierarchy. Saaty (2005) claims that the development of ANP was a response to many decision problems which cannot be structured hierarchically due to the interaction and dependence of the elements. Saaty (2005) stated that ANP is "useful way to deal with complex decisions that involve dependence and feedback analysed in the context of benefits, opportunities, costs and risks". Since that the ANP deals with the interdependences between

criteria and alternatives, it is recommended to be used to justify decisions and define relations between various elements in a complex system with multi factors and high interdependences.

2.3. Using MCDM tools in governance evaluation

MCDM tools have been widely used or recommended in evaluation models of complex systems. In their research, Antunes et al (2009) have presented a comparison of three deliberative methods which are participatory modelling, deliberative visioning and multi criteria evaluation aiming at appreciating complex structural dynamics. In their research, they concluded that "multi-criteria evaluation contributes to a better appraisal of options and trade-offs" (Antunes et al. 2009). also, they recommended using combination of tools and methods to eliminate biases of each method. They have also highlighted the significance of carefully selecting participants groups in the evaluation.

The research conducted by Uyl and Driessen (2015) have highlighted the significance of conducting a wide and detailed evaluation of complex issues related to sustainable developments. They also recommended an approach to advance the understanding of governance at sustainable developments and its related issues through using multiple criteria (Uyl and Driessen 2015). Liu et al. (2012) have used hybrid MCDM models to examine dependency among various criteria and dimensions of tourism policies using DEMATEL ANP to determine relative weights of the criteria and VIKOR was used to determine the improvement priority. Final results were used to suggest optimal improvement plan for Taiwan Tourism policy. Romeo & Marciano (2014) has developed a model for evaluating performance of development process of leader approach in the rural development program in Calabria by selecting good governance factors and developing indicators from the literature and based on interviews with experts. AHP and fuzzy techniques were used for order performance by similarity to ideal solution (fuzzy – topsis). Good governance criteria were weighted using AHP fuzzy and ranking performance was done using fuzzy TOPSIS. According to Romeo & Marciano (2014), the advantages of combining different MCDM tools were a response to the nature of data processed so the fuzzy approach allowed modelling "model real life situations which cannot be properly taken into account with crisp data, given the presence of vague human judgments" so using AHP enabled representing "high variability judgments" by experts that are hard to be represented with numeric values. In addition, using synthetic index of performance score allowed comparing results among each alternative (Romeo and Marciano 2014). The research by (Romeo and Marciano 2014) supports the research by (Uyl and Driessen 2015) and used MCDM for evaluation model and the research of (Liu et al. 2012) and used hybrid MCDM tools in the evaluation model and they responded to the recommendation of (Liu et al. 2012) to use different sources to obtain input for the criteria by using literature and input from experts as sources. Cobo et al. (2014) have developed an IT Governance evaluation model to evaluate the level of performance of IT governance based on maturity level of COBIT processes using fuzzy analytic hierarchy process for obtaining single assessment value of criteria based on selected indicators. The methodology used assumed that criteria elements were independent. However, the research concluded that using an ANP model in future research would define complex interrelationships between process (Cobo et al. 2014). Zhao et al. (2017) have developed an AHP-ANP-Fuzzy Integral integrated network for evaluating performance of innovative business models for sustainable buildings. The researchers have obtained criteria and indicators from literature and from experts then examined the interdependencies among criteria and indicators after that they obtained criteria weight using AHP and ANP. Then they used fuzzy integral to model the impacts of the interdependencies on the weights and the derived final evaluation scores of the alternatives.

Therefore, due to the wide application in the literature of MCDM tools in governance performance evaluation models, this research will use AHP and ANP to determine ranking and criteria weights and final evaluation scores of the alternative due to its wide applications in similar environments with complex nature and for similar purpose of evaluation. However, further literature review will be carried out to confirm validity of the proposed tools in model development.

3. Research Methodology

3.1. Model Development

The practice of generating field specific governance indicators has gained increased focus by researchers with

successful applications in practice by international organizations that aim to accomplishing advanced implementations of worldwide goals. Since that the literature review generated for this research showed no evidence about availability of governance evaluation model for AIUD or related fields, this research suggest developing a governance evaluation model for AIUD which shall be used for international comparison of performance, promoting citizens participation and multi stakeholders engagement, and assessing quality of governance to demonstrate performance and identify needed improvement. The proposed governance evaluation model is built according to the research methodology shown in fig.1 below.

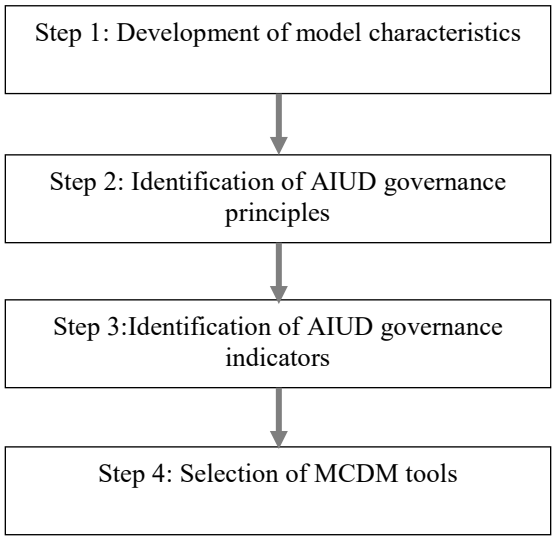

Fig. 1: Research Methodology of Model Development

Step 1: Development of model characteristics

Due to lack of AIUD governance evaluation models, research was conducted to propose characteristics of the suggested model as listed in table 1 below. The proposed model characteristics are based on literature to define component and source of input.

Table 1. AIUD Governance Evaluation Model Characteristics

Obtaining Indicators from literature and from experts	(Romeo & Marciano 2014) (Clae et al 2017)
Indicators shall be divided into three categories as: structure, process, and outcome.	(Hung & Jerng 2014) (Deerberg-Wittram et al. 2013)
Indicators should be valid, reliable, sensitive, and specific	(Clae et al 2017)
Consider public participation	
Indicators should have theoretical grounding; focus on specific fields of engagement; emphasize outcomes; and control for key contextual differences in comparing countries	(Andrew et al 2010)

Input from multi stakeholders from different sectors	(Mu & Jong 2016) (Uyl and Driessen 2015) (Stewart 2006) (Verdugo et al 2017)
Identify relations between the principled and the relations between indicators in addition to the relation between principles and indicators	(Kisingo et al. 2016)

Step 2: Identification of governance model principles

Governance principles have been used in the literature and in practice to define elements that requires evaluation. Lockwood (2010) has defined governance principles as "normative statements that make claims about how governing or steering should happen and in what direction– that is, how governance actors should exercise their authorities". Governance principles are presented in different sets in the literature according to the field of research. The literature review resulted in different sets of governance principles in different references (Bovaird 2005;Doeveren 2011; Juiz et al. 2014; Lockwood 2010). For the purpose of this research, the governance principles recommended by the UN Inter-agency Meeting on Urban Governance will be used as it is recommended by UN Habitat. Proposed governance principles are: 1. Effectiveness, 2. Equity, 3. Participation, 4. Accountability, 5. Security.

Step 3: Identification of AIUD governance indicators

The literature review conducted for the purpose of this study returned no results for an accessible or inclusive urban developments. Researchers have recommended to develop field specific governance evaluations models and indicators to ensure reliable results to support decision making. Therefore, a systematic literature review shall be carried out to identify governance indicators from literature and the results will be refined by group of experts to develop the final list of an AIUD specific indicators. Multicriteria decision making tool – AHP will be used to rank priority of the indicators and link them to the governance principles.

Step 4: Application of MCDM tools

The existing literature which discussed governance evaluation in complex systems, have recommended using multi criteria decision making tools due to its applicability in complex environments with high un certainty and multi actors. MCDM tools were used in the literature to rank performance and prioritize improvement actions. In addition, due to the high dependency between actors in AIUD due to distribution of resources needed among different actors, MCDM tools were used successfully in the literature to determine dependency between actors and criteria.
The proposed model - shown in fig.2. below - applied ANP MCDM tool due to its characteristics in resolving complex issues and sustainable development issues in literature and practice (Sanga et al. 2013; Uyl and Driessen 2015). The proposed model will be built considering the goal of ranking performance of different stakeholders and proposing improvement priority between stakeholders and governance principles. The proposed criteria will be the governance principles and sub criteria will be the indicators ranked in the first stage and the alternatives will be represented by stakeholders. MCDM tool will be used to determine dependency among various criteria and indicators in addition to determining relative weights and priority of criteria in evaluation models (Antunes et al. 2009; Liu et al. 2012; Romeo and Marciano 2014).

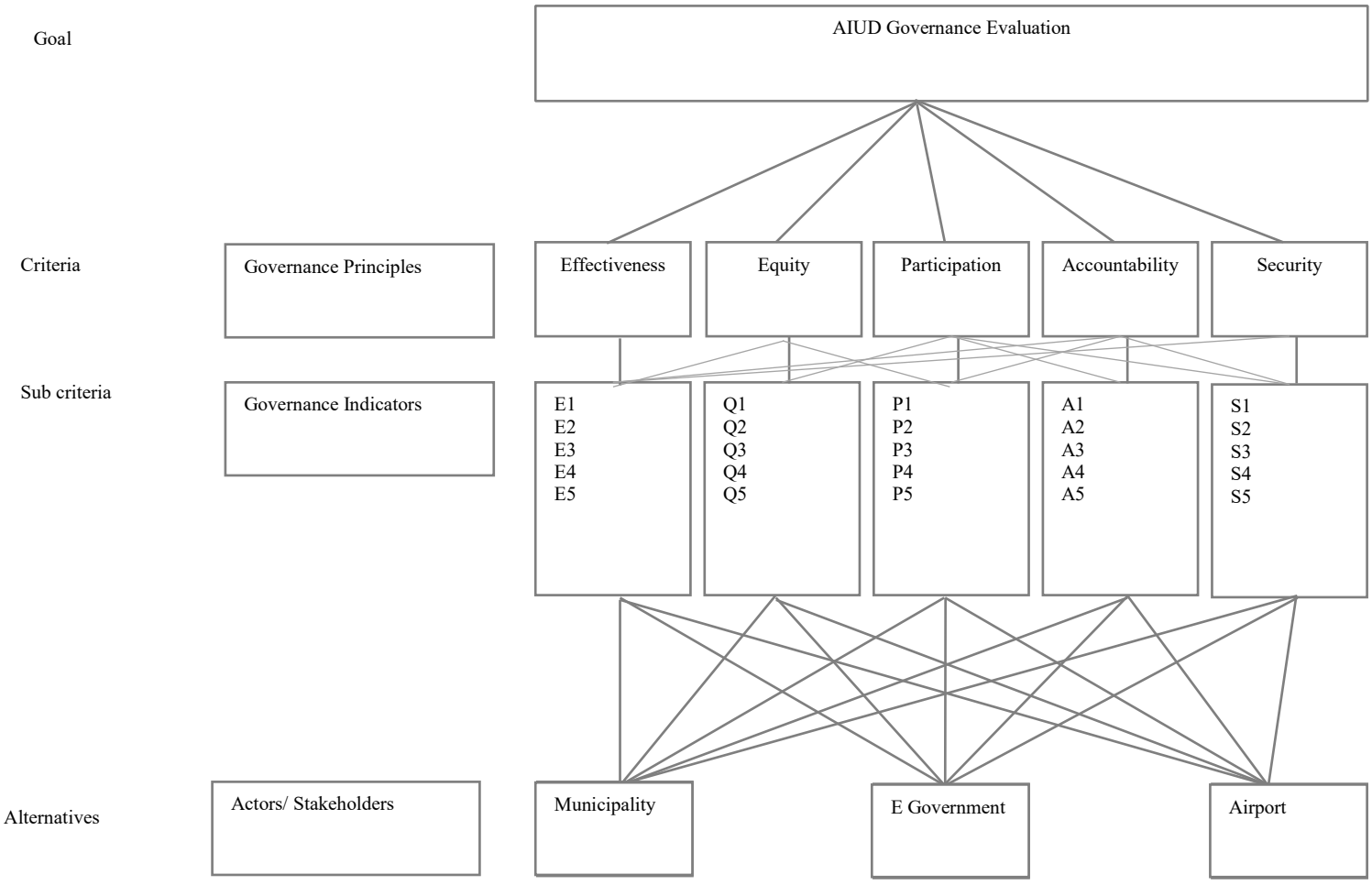

Fig 2. Proposed governance evaluation model for AIUD

4. Conclusion

While Accessible and Inclusive Urban Development is gaining world wide concern due to states aspiration to comply with global movement driven by the United Nations emphasis on Sustainable Development Goals, active efforts is witnessed to develop policies and initiatives to implement inclusive developments. AIUD is a complex field involving multi sectoral and multi stakeholders with high uncertainty. Different fields with similar characteristics have utilized governance principles to develop governance evaluation models to evaluate governance performance in specific fields such as environment, coastal management, protected areas and transit oriented developments. Yet, regardless of these efforts, there is lack of governance evaluation models to evaluate governance performance in the field of AIUD.

This research proposes a methodology to develop governance evaluation model in the field of AIUD using MCDM tools which will introduce a powerful tool to allow support to decision making and resource allocation, allow comparing performance between different cities/ countries, assessing quality of governance to demonstrate performance and identify needed improvement, allow public participation and create a knowledge base for future research in the field and further development of empirical research.

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