Original Article

Kenyan Government Involvement on BIM and its Effect on BIM Adoption amongst Building Contractors.

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ABSTRACT

Building Information Modelling (BIM) has been touted as a new outstanding technology and governments who have noticed this is getting involved. This study investigated the current level of the Kenyan Government's involvement and how this has influenced adoption amongst building contractors. This study also compares global trends in the context to Kenya. This study identified roles like initiation and regulation that governments could undertake to encourage adoption. A random sampling of registered contractors with active construction sites within Nairobi County was used to identify respondents. Using a one-sample t-test with a universal mean of 2 representing weak government involvement, with $t(61) = 2.39$, $\alpha > 0.05$, $M = 2.05$ and $S = 1.53$, the Kenyan government's involvement in BIM and its performance on the roles was weak. There was no relationship between the government roles and BIM except for BIM Initiation which had a weak positive relationship. This study makes recommendations like the creation of a legal BIM mandate and the establishment of a BIM implementation body This is the first in-depth study in Kenya that critically looks at the government's role on issues relating to BIM amongst Building contractors and gives precedence for subsequent comparative studies locally or regionally.

INTRODUCTION

Background Information

Construction is a critical sector of development in any economy. In Kenya, the sector's GDP contribution in 2019, before disruptions by the COVID-19 pandemic, was valued at $5.2B, which was 5.6% of the economy (KNBS, 2020, p. 27). When secondary contributors like mining and manufacturing to the construction industry are included, the overall contribution was 8.5%. Despite this contribution, this sector experiences several challenges with the outstanding one being the low absorption of development expenditure for construction in the public sector (KPBO, 2020, p. 18) due to the inability to streamline the industry. This is due to the diverse client tastes, diverse actors, different delivery methods (Alhusban et al., 2017, p. 109), different deliverables (Enynon, 2016, p. 113), diverse workflow processes (Arayici, 2015, p. 72), and different tools. A combination of diversity of these attributes bogs down the construction process making it inefficient (Gwaya, 2016, p. 30). Building Information Modelling (BIM) has been touted as an efficient manager to these diversities.

BIM is a concept around virtual modelling and construction of assets like infrastructure and buildings during which relevant information is embedded into the virtual model throughout its lifecycle (Enynon, 2016, p. 3). This process enables the consolidation of various capabilities generated by the various actors, delivery methods, deliverables, and workflow processes into few seamless BIM tools. Examples of these capabilities are 3D parametric modelling, 4D modelling, 5D modelling, Integrated Design Coordination, Interoperability and Clash Detection, Structural Analysis, and Modelling.

While there has been a notable growth of BIM adoption in jurisdictions like Chile, Singapore, UK, and USA, this has not been reflected within the Kenyan Construction Industry whose adoption rate is still low (Manza, 2016, p. 18). The main objective of this study, therefore, is to establish the level of Kenyan Government involvement on BIM issues amongst Building contractors by assessing the level of performance on key indicators associated with government involvement in BIM. This study aims at establishing various strategies that would assist the Government of Kenya to start planning and prioritizing for BIM adoption.

To Govern or Not to Govern?

BIM offers digital modelling, data embedding and collecting technologies that aid to integrate design, analysis, simulation, construction, maintenance and decommissioning (Furneaux & Kivvits, 2008, p. 6). This BIM process is critical to governments since it helps amongst other things, in creating a detailed national database of public and private assets. These databases help governments in making critical decisions like planning, budgeting, and life-cycling public assets.

While it is agreeable amongst most BIM researchers that globally, the level of BIM awareness is high (James et al., 2016, p. 10), the level of BIM adoption varies. Table 1 compares the level of government involvement and BIM adoption levels in various jurisdictions as of June 2019. While several factors may be causing the varying levels of BIM adoption, there is a strong correlation between government

involvement on issues of BIM and the level of BIM adoption in the said jurisdiction.

Table 1: Levels of BIM Adoption in various jurisdictions (Source-Author)

Country	Percentage of BIM Adoption	Year in question	Is the government involved?	If yes, how	Source
Chile	53%	2016	NO	n/a	(Loyola & López, 2018, p. 3)
France	38%	2017	NO	n/a	(ECSO, 2019, p. 9)
Germany	25%	2018	NO	n/a	(WEF & BCG, 2018, p. 6)
Singapore	80%	2015	YES	Mandates, Policy generator, Funder	(Zakaria et al., 2013, p. 3)
UK	73%	2019	YES	Mandates, Policy generator, Funder, Researcher	(NBS, 2019, p. 9)
USA	79%	2013	YES	Policy generator, Funder, Researcher	(Cheng & Lu, 2015, p. 4)

Most governments have taken note of this correlation and have started getting involved on issues of BIM. Chile is fast-tracking its mandate by making BIM mandatory in all public projects by 2020 (Loyola & López, 2018, p. 3), Germany had also put in place a mandate to implement level 1 BIM from 2010 (Galić et al., 2017, p. 7). In France, though the government has deliberately avoided imposing a mandate, it is using its policies in the housing industry to improve BIM uptake (European Construction Sector Observatory, 2019, p. 9).

THEORIES OF TECHNOLOGY ADOPTION

This study limited itself to Diffusion of Innovation Theory and Hype-Cycle Theory with a specific aim of understanding how government involvement influences adoption rates.

Diffusion of Innovation and Government Involvement.

This theory was pioneered by Peter Schumpeter in 1912 where he showed a linear progression on the spread of technology (Sarkar, 1998, p. 1). Diffusion is a mechanism that spreads new products and processes (products hereafter) in an economy, thereby displacing existing products. Where a product is not free, potential adopters will gauge the cost incurred and benefits accrued. Where benefits exceed the cost, successful innovation will have taken place (Rogers, 1983, p. 11) and adoption will be easy. In such a situation, the government gets involved as a *regulator* to ensure that products to be released shall be helpful and not harmful. Where cost exceeds benefits, successful innovation will not have taken place and adoption would be difficult. Where the government sees a long-term benefit of the product despite the high-cost low benefit, it intervenes as a *mandator* and compels the public to adopt it. The success of diffusion relies on the need for information about the product to be communicated (Chang, 2010, p. 2) and spread as far and fast as possible.

Where the innovation is successful, product information is effortlessly spread through contagion and influence from peers and the government does not need to get involved. Where the innovation is not successful, the government gets involved in influencing communication as a *broadcaster* and

demonstrator. The success of innovation relies on a short timeline between innovation dissemination and adoption. Where the innovation is successful, adoption time for the product is short and the government does not need to get involved. Where the innovation is not successful, the adoption time may get longer, and the government may intervene as a *policy maker* and impose time deadlines for the adoption of the product.

Hype-Cycle and Government Involvement

This theory was pioneered by Gartner Research Inc in 1995 and it characterizes the typical progression of an emerging technology from over-enthusiasm through a period of disillusionment to an eventual understanding of the technology's relevance and role in its market (Fenn & Linden, 2003, p. 5). Hype-cycle is a mechanism that spreads new products in an economy through strong publicity using mass media and communication interfaces. During the technology trigger phase, on the rising phase and at the peak phase (Zainon et al., 2011, p. 5), the innovators do a lot of marketing for their product. Where the government does not have a direct interest in the product, it comes in as a *regulator*. Where it is an interested party, the government comes in as an *initiator/driver, adopter, funder, broadcaster* and *demonstrator*, and *researcher.* During the trough of disillusionment phase when adopters leave the product in droves (Muñoz-Saavedra et al., 2020, p. 5), where the government is not an interested party, it just watches the near-collapse of the product. Where the government is an interested party, it intervenes as a *mandator* to compel adopters to continue using it. During the slope of enlightenment stage when the innovators refine their second-generation product (Lajoie & Bridges, 2014, p. 2), where the government has no interest it refines its *regulations* and *policies* to prevent the previous experience again. Where the government is an interested party, its involvement as a *funder* and *researcher* is enhanced to ensure that the product is refined.

ROLES OF GOVERNMENT IN BIM ADOPTION AND CONCEPTUAL FRAMEWORK

Based on the discussions of theories above, the government comes out as a major player in influencing BIM adoption.

Government as a BIM Initiator, Driver and Demonstrator

Governments as the biggest consumers (Al-abri et al., 2018, p. 5) have the potential of becoming chief adopters of BIM technologies within its jurisdiction. Where the government needs to internally design and execute various economic and infrastructural projects and therefore has a department of Public Works (Musa et al., 2018, p. 3), BIM adoption tends to go up because of the mass adoption by government entities. Most governments whose countries have a high BIM adoption take advantage of this to showcase the technology by broadcasting and demonstrating its capabilities to the public in a bid to convince the public to join them in using the BIM tool. Various governments have started generating localized BIM templates to be used within their jurisdiction (CIBSE & TUD, 2020, p. 56), generating BIM training guides (BCA, 2013, p. 5), sponsoring of BIM seminars and bootcamps (Pal & Nassarudin, 2020, p. 5) and availing BIM laboratories (Maharika et al., 2020, p. 25).

Government as a BIM Mandator

Where there is a need to intervene on the level of BIM adoption, the government can use legal instruments/mandates (Cao & Chen, 2018, p. 1) to make it compulsory to adopt BIM. The UK government has come out as a global leader in the digital transformation of the construction industry (NBS, 2019, p. 6) due to the imposition of the BIM Level 2 mandate in the UK in 2016.

Government as a BIM Regulator

Where the government externally and indirectly uses BIM technologies as a Project Client, it comes in as a strong regulator by imposing minimum requirements of using BIM in their projects for potential service providers to conform (Eadie et al., 2015, p. 1) if at all they want to do business with the government. The General Services Administration (GSA hereafter) of the US government is outstanding on this. Though there is no existing BIM mandate in the USA, GSA imposed a regulation in 2007 that all public projects must be done in BIM (Tse, 2009, p. 63).

Government as a BIM Funder

To accelerate the rate of BIM adoption, governments may fund various facets of BIM activities. Singapore (Tahrani et al., 2015, p. 5) and UK (Arayici, 2015, p. 214) are outstanding when it comes to funding of the mandated bodies, while UK is outstanding on research funding of BIM(Underwood & Ayoade, 2015, p. 12) and Singapore is outstanding in the funding of BIM training (Kalfa, 2018, p. 6)

Government as Policy Generator

To guide certain aspects and standards in terms of methodology and deliverables for BIM, the government creates certain policies for this. Examples of such policies include the creation of template files (NBS, 2017, p. 33), open BIM and interoperability (McAuley et al., 2017), eBIM permits (Tse, 2009, p. 63), and BIM software certification (NIBS & buildingSMART 2012, p. 628).

Government as a Task Group Creator

When certain policies generated as discussed above need attention to ensure proper implementation of the said specific policies, then time-limited task groups are normally created to assist in this (NBS, 2017, p. 28). Examples of such task groups include the EU BIM Task group formed in 2016 for 2 years whose task was to gather collective experience of BIM stakeholders within the EU zone with an aim of understanding various aspects of BIM; like what each country has already done on issues of BIM, what benefits have been accrued from these actions and generate a common EU definition of BIM (EUBIM Task Group, 2016, p. 4). Another example is the Bew-led UK BIM Task group formed in 2012 with a task of delivering BIM and soft landings in the UK public sector by 2016 (Enynon, 2016, p. 20).

Conceptual Framework

Figure 1: Conceptual Framework
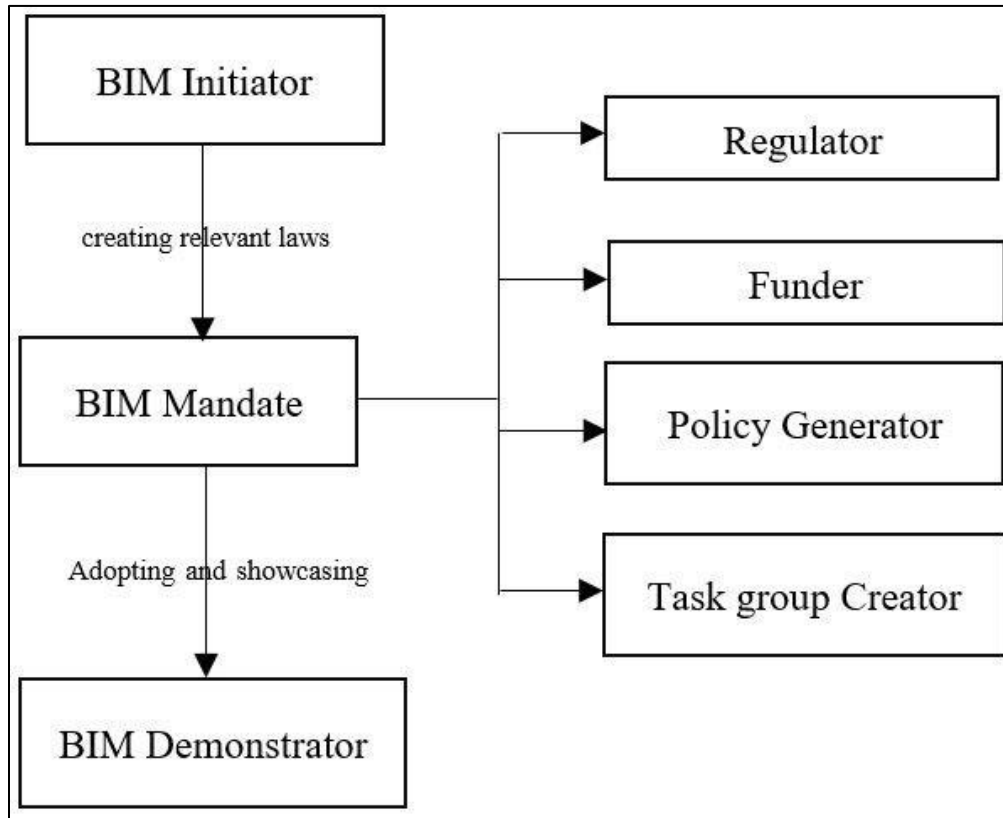
To understand government involvement on BIM issues, this study investigated the current state of roles of government in BIM as discussed. *Figure 1* is the conceptual framework showing how these roles may relate to influencing the level of government involvement on BIM with an aim of influencing BIM adoption.

RESEARCH METHODOLOGY

This study uses a survey method incorporating questionnaires for Building contractors and structured interviews for statutory bodies in Kenya. With the population of National Construction Authority (NCA) Class 4 and above registered building contractors being 1665, the sample size was 95. Questionnaires were manually administered in 95 active construction sites within Nairobi. The respondents were a member of staff with an executive role in the said organisation. A five-point Likert scale was used to test opinions of Building contractors on various parameters. SPSS was used to analyse the data.

Data Analysis

Data Reliability and Demographics of Responsive Respondents

The Cronbach's alpha achieved indicated a high level of data reliability (20 items: $\alpha = 0.93$). 62 out of 95 responded giving a response rate of 65.26%. Demographics of respondents were diverse with the predominant age being between 41 to 45, practice experience between 11 to 15 years, and have used BIM in less than 5 projects. The normality tests showed that age, years of practice, and years of using BIM were normally distributed while projects done were non-normally distributed.

SURVEY RESULTS

Relationship between Government as an Initiator and BIM Adoption

The first secondary task of this study was to investigate the relationship between the Government as an initiator, driver, and broadcaster of BIM and BIM Adoption levels amongst Main Contractors. The null hypothesis (H_o) stated that the participation of the government in BIM as an initiator, driver, and broadcaster was low, while the alternate hypothesis (H_a) stated that participation levels were either too low, moderate, high, or too high. The government initiation score was generated using the average score of government generation of localized BIM templates, government generation of BIM training guides, government sponsoring of BIM specialized CPD seminars and bootcamps, and government availing of BIM laboratories. Using one-sample t-test with t (61) = 0.617, $\alpha > 0.05$, M = 2.13, SD = 1.61 (see *Table 8*), our survey is not significantly different from the null hypothesis.

Table 2: One sample t-test result for "Government as a BIM Initiator" score.

	One-Sample Statistics				One-Sample Test			
					Test Value = 2			
	N	Mean	Std. Dev.	Std. Err.	t	df	Sig.	Mean Diff.
Localised BIM standard templates and data formats	62	2.13	1.769	.225	.574	61	.568	.129
BIM training guides and codes	62	2.48	1.897	.241	2.009	61	.049	.484
BIM specialised CPD seminars	62	2.19	1.763	.224	.864	61	.391	.194
Short term boot camps	62	1.92	1.540	.196	-.412	61	.681	-.081
Institutional based BIM laboratories	62	1.90	1.647	.209	-.463	61	.645	-.097

Narrowing down to individual indicators as shown in *Table 2*, government involvement in generating localized BIM templates with t(61) = 0.574, $\alpha > 0.05$, M = 2.13, SD = 1.77; government initiated BIM specialized CPD seminars with t(61) = 0.864, $\alpha > 0.05$, M = 2.19, SD = 1.76; government sponsoring short term bootcamps with t(61) = -0.412, $\alpha > 0.05$, M = 1.92, SD = 1.54 and government initiated Institutional based BIM laboratories with t(61) = -0.463, $\alpha > 0.05$, M = 1.90, SD = 1.65 were not significantly different from the null hypothesis. Government Initiated BIM training guides and codes with t (61) = 2.00, $\alpha < 0.05$, M = 2.48, SD = 1.90 was significantly different from the null hypothesis since the score was moderate.

On the Pearson Relationship between the government as an initiator and BIM adoption, with $p < 0.05$, as shown in *Table 3*, these variables had a weak positive correlation. A one-way ANOVA test was done with the null hypothesis (H_o) stating that variances were equal amongst the indicators tested while the alternate hypothesis (H_a) stating that these variances were not equal amongst the indicators that generate the scores. The ANOVA summary in *Table 4* below indicates that with $p < 0.05$, the null hypothesis was rejected and 52% of BIM adoption

was explained by the role played by the government as an initiator, and variance between the various groups was 5 times greater than variances within the groups. These two results showed a weak relationship between these two variables causing us to do a bivariate regression model.

Table 3: Correlation between "Government as an Initiator" Score and BIM Adoption

Correlations		Government as a BIM Initiator Score	Overall BIM Adoption Score
Government as a BIM Initiator Score	Pearson Correlation	1	.287*
	Sig. (2-tailed)		.024
	N	62	62

. Correlation is significant at the 0.05 level (2-tailed).

Table 4: One-way ANOVA Test between "Government as an Initiator" Score and BIM Adoption

Tests of Between-Subjects Effects						
Dependent Variable: Overall BIM Adoption Score						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	69.384ᵃ	11	6.308	4.991	.00	.523
Intercept	115.962	1	115.962	91.749	.00	.647
Government as a BIM Initiator Score	69.384	11	6.308	4.991	.00	.523
Error	63.195	50	1.264			
Total	375.109	62				
Corrected Total	132.579	61				

a. R Squared = .523 (Adjusted R Squared = .418)

For the bivariate model, with a null hypothesis (H_o) stating that none of the coefficients in the "Government as an Initiator" score predict BIM adoption with the alternate hypothesis (H_a) stating that most of the coefficients in the "Government as an Initiator" score predict BIM adoption, as shown in *Table 5*, with sig (p) < 0.05, the null hypothesis was rejected with the regression equation for this relationship stating that:

BIM Adoption Score = 0.263 x "Government as a BIM initiator" Score + 1.418

Table 5: Bivariate Regression Model between "Government as an Initiator" Score and BIM Adoption

Coefficientsᵃ					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model	B	Std. Error	Beta		
1 (Constant)	1.418	.302		4.701	.000
Government as a BIM Initiator Score	.263	.114	.287	2.321	.024

a. Dependent Variable: Overall BIM Adoption Score

Relationship between Government as a Mandator and BIM Adoption

The second secondary task of this study was to investigate the relationship between the Government as mandator and BIM Adoption levels amongst Main Contractors. The null hypothesis (H_o) stated that the participation of the government in BIM as a mandator was low, while the alternate hypothesis (H_a) stated that participation levels were either too low, moderate, high, or too high. Using one-sample t-test with t (61) = -0.764, $\alpha > 0.05$, M = 1.84, SD = 1.66 (see *Table 8*), our survey is not significantly different from the null hypothesis.

On the Pearson Relationship between the government as a mandator and BIM adoption, as shown in *Table 9*, with p > 0.05, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the bivariate relationship.

Relationship between Government as a Regulator and BIM Adoption

The third secondary task of this study was to investigate the relationship between the Government as regulator and BIM Adoption levels amongst Main Contractors. The null hypothesis (H_o) stated that the participation of the government in BIM as a regulator was low, while the alternate hypothesis (H_a) stated that participation levels were either too low, moderate, high, or too high. Using one-sample t-test with t (61) = -0.574, $\alpha > 0.05$, M = 1.87, SD = 1.77 (see *Table 8*), our survey is not significantly different from the null hypothesis.

On the Pearson Relationship between the government as a regulator and BIM adoption, as shown in *Table 9*, with p > 0.05, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the bivariate relationship.

Relationship between Government as a BIM Funder and BIM Adoption

The fourth secondary task of this study was to investigate the relationship between the Government as BIM funder and BIM Adoption levels amongst Main Contractors. The null hypothesis (H_o) stated that the government funding of BIM activities was low, while the alternate hypothesis (H_a) stated that participation levels were either too low, moderate, high, or too high. Using one-sample t-test with t (61) = 0, $\alpha > 0.05$, M = 2.00, SD = 1.70 (see *Table 8*), our survey is not significantly different from the null hypothesis.

On the Pearson Relationship between the government as a BIM funder and BIM adoption, as shown in *Table 9*, with p > 0.05, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the bivariate relationship.

Relationship between Government as a BIM Policy Generator and BIM Adoption

The fifth secondary task of this study was to investigate the relationship between the Government as a BIM policy generator and BIM Adoption levels amongst Main Contractors. The null hypothesis (H_o) stated that participation of government on BIM policy generation was low, while the alternate hypothesis (H_a) stated that participation levels were either too low, moderate, high, or too high. Government Policy Generation Score was generated using the averages of the indicators namely Interoperability, BIM e-submission, open BIM, and BIM software certification. Using one-sample t-test with t (61) = 0.904, $\alpha > 0.05$, M = 2.22, SD = 1.90 (see *Table 8*), our survey is not significantly different from the null hypothesis.

Narrowing down to individual indicators as shown in *Table 6*, government policies on BIM interoperability with t(61) = 0.674, $\alpha > 0.05$, M = 2.16, SD = 1.88; government policies on e-BIM submission and permits with t(61) = 0.906, $\alpha > 0.05$, M = 2.23, SD = 1.96; government policy on open

BIM with t(61) = 1.09, α > 0.05, M = 2.26, SD = 1.96 and government policy on BIM software certification with t(61) = 0.906, α > 0.05, M = 2.23, SD = 1.96(see *Table 8*) were not significantly different from the null hypothesis.

Table 6: One sample t-test result for "Government as a BIM Policy Generator" score

| | One-Sample Statistics | | | | One-Sample Test | | | |
| | | | | | Test Value = 2 | | | |
	N	Mean	Std. Dev	Std. Err	t	df	Sig.	Mean Diff
Interoperability of BIM tools	62	2.16	1.883	.239	.674	61	.503	.161
e-Building submission and permits	62	2.23	1.962	.249	.906	61	.368	.226
Open BIM	62	2.26	1.864	.237	1.090	61	.280	.258
BIM software certification	62	2.23	1.962	.249	.906	61	.368	.226

On the Pearson Relationship between the government as a BIM Policy generator and BIM adoption, as shown in *Table 9*, with p > 0.05, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the bivariate relationship.

Relationship between Government as a BIM Task Group Creator and BIM Adoption

The sixth secondary task of this study was to investigate the relationship between the Government as a BIM task group creator and BIM Adoption levels amongst Main Contractors. The null hypothesis (Ho) stated that the government creation of BIM task groups was slow, while the alternate hypothesis (Ha) stated that creation processes were either too slow, moderate, quick or too quick. Government Task group Score was generated using the averages of the indicators namely creation of BIM-related statutory and professional bodies and creation of BIM specific task group. Using one-sample t-test with t (61) = 1.138, α > 0.05, M = 2.23, SD = 1.56 (see *Table 8*), our survey is not significantly different from the null hypothesis.

Narrowing down to individual indicators as shown in *Table 7*, creation of BIM specific bodies with t (61) = 0.646, α > 0.05, M = 2.13, SD = 1.57 and BIM specific task groups with t (61) = 1.333, α > 0.05, M = 2.32, SD = 1.91 were not significantly different from the null hypothesis.

Table 7: One sample t-test result for "Government as a BIM Task group Creator" score

| | One-Sample Statistics | | | | One-Sample Test | | | |
| | | | | | Test Value = 2 | | | |
	N	Mean	Std. Dev.	Std. Err.	t	df	Sig.	Mean Diff.
Statutory bodies and professional organisations	62	2.13	1.573	.200	.646	61	.521	.129
Government backed task groups on BIM	62	2.32	1.906	.242	1.333	61	.188	.323

On the Pearson Relationship between the government as a BIM task group creator and BIM adoption, as shown in *Table 9*, with p > 0.05, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the bivariate relationship.

Relationship between Government Involvement in BIM and BIM Adoption.

The primary tasks of this study were to investigate the level of government involvement on issues of BIM in Kenya and to see the relationship between this involvement and BIM adoption levels amongst main contractors. The null hypothesis (H_o) stated that the government involvement on issues of BIM was low, while the alternate hypothesis (H_a) stated that involvement was either too low, moderate, high, or too high. Government Involvement Score was generated using the averages of all the factors discussed above. As shown *in Table 8*, using one-sample t-test with $t(61) = 0.239$, $\alpha > 0.05$, $M = 2.05$, $SD = 1.53$, our survey is not significantly different from the null hypothesis.

Table 8: One sample t-test result for "Government Involvement in BIM" score and the other factors

	One-Sample Statistics				One-Sample Test Test Value = 2			
	N	Mean	Std. Dev.	Std. Err.	t	df	Sig.	Mean Diff
"Government Involvement in BIM" Score	62	2.05	1.532	0.195	.239	61	.812	.047
"Government as a BIM Initiator" Score	62	2.13	1.606	0.204	.617	61	.540	.126
"Government as a BIM Mandator" Score	62	1.84	1.661	0.211	-.764	61	.448	-.161
"Government as a BIM Regulator" Score	62	1.87	1.769	0.225	-.574	61	.568	-.129
"Government as a BIM Funder" Score	62	2.00	1.699	0.216	0.000	61	1.000	0.000
"Government as a BIM Policy Generator" Score	62	2.22	1.896	0.241	.904	61	.369	.218
"Government as a BIM Task group Creator" Score	62	2.23	1.562	0.198	1.138	61	.259	.226

On the Pearson Relationship between government involvement in BIM and BIM adoption, as shown in *Table 9*, with $p > 0.05$, these variables were not significantly correlated thereby eliminating the need of doing the one-way ANOVA test and generating the multivariate relationship

Table 9: Pearson Correlation between roles of Kenyan Government in BIM and BIM Adoption

Correlations		Overall Adoption Score
Overall BIM Adoption Score	Pearson Correlation	1
	Sig. (2-tailed)	
	N	62
"Government Involvement in BIM" Score	Pearson Correlation	.167
	Sig. (2-tailed)	.194
	N	62

Correlations

		Overall Adoption Score
"Government as a BIM Initiator" Score	Pearson Correlation Sig. (2-tailed) N	.287[*] .024 62
"Government as a BIM Mandator" Score	Pearson Correlation Sig. (2-tailed) N	.160 .214 62
"Government as a BIM Regulator" Score	Pearson Correlation Sig. (2-tailed) N	.245 .055 62
"Government as a BIM Funder" Score	Pearson Correlation Sig. (2-tailed) N	.133 .304 62
"Government as a BIM Policy Generator" Score	Pearson Correlation Sig. (2-tailed) N	-.001 .995 62
"Government as a BIM Task group Creator" Score	Pearson Correlation Sig. (2-tailed) N	.098 .447 62

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

STATUS OF GOVERNMENT INVOLVEMENT ON BIM IN KENYA.

The level of BIM Adoption by Building contractors in Kenya is low, compared to global standards which may be explained by low government involvement on BIM-related matters besides other factors. It is good to contextualise how governments function in Kenya to have a proper understanding of this discussion. In 2010, a new constitution was promulgated which devolved construction-related functions to County governments (GOK, 2010, p. 176) thereby creating 48 entities that are supposed to initiate the six roles discussed under the roles of government to enable BIM adoption in their respective jurisdictions.

With regards to the government being a chief BIM initiator, it clearly came out that within the state department for public works and the 47 departments of urban development had no clear rules with regards to BIM adoption by the governments. The level and efficacy of BIM adoption by designers depended on the individual attitude and effort of the officers involved. With regards to BIM mandating, regulating, policy generating, and specific task group creating, the performance of both levels of government was low. Only 4 out of the 47 counties offer e-submission services for construction permits, and they use the lowest level 0 of BIM maturity (Awwad et al., 2020, p. 2) which allows submission of non-parametric pdf files. The National government through NCA also offers e-submission services for compliance certificate before construction and use level 0 of BIM maturity. With regards to the funding of BIM activities, participation of both levels of government is low. There was no budget allocation for BIM-related activities in any of the governments for the fiscal year running from July 2020 to June 2021. With this situation, building contractors are neither motivated nor compelled to adopt BIM.

RECOMMENDATIONS

There is a need to urgently establish a statutory body similar to the Hong Kong Institute of BIM (Ho, 2020, p. 7) in Kenya to handle and coordinate all BIM related activities, from GIS mapping (Zhu et al., 2020, p. 1), to City Information Modelling (Furjani et al., 2020, p. 3) to BIM in Kenya. This body will coordinate the use of relevant instruments like BIM mandates, policies, and regulations within the two levels of government to push BIM maturity from Level 0 to level 3 within 10 years. This body shall be involved in issues of BIM training at the post-secondary level and in actual practice, progressively improve BIM standards, codes, and guides in Kenya.

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