HOUSING SUBSIDY QUANTUM AND INNOVATIVE BUILDING SYSTEMS- A CRITICAL LITERATURE REVIEW

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INTRODUCTION

- Household debt as % of disposable income is declining: 85.7% (2008) to 72% (2017).
- National savings rate decreasing 16% in 3rd Qrt to 15.8% in 4th Qrt of 2017 (South African Reserve Bank-SARB).
- Consumers with good credit rating -15.62 million (60.745%); those with impaired credit rating -9.7 million (National Credit Regulator: Latest quarterly credit report)
- Bottom 50% households account for 8% of household incomes; top 10% households account for 55% of household incomes.
INTRODUCTION

• Acute housing backlog of 2 million units compared to 1.5 million in 1994 (South African Institute for Race Relations-SAIRR)

• Number of Informal Settlements 2225 - Stats SA.

• Number of Backyard dwellings nearly doubled from 19% to 36% - Stats SA.

• Need for innovative Building Solutions to try to address these problems.

• Reduction in homelessness and urban crime (which is quite often linked to high income inequalities).

• Improvement in quality of life in urban and rural areas.
INTRODUCTION

• Subsidy amount based on cost of building materials (brick and mortar)
• Innovative building systems affect -construction process & construction procurement and payment schedules.
• Need for innovative Building Solutions to try to address these problems.
• Reduction in homelessness and urban crime (which is quite often linked to high income inequalities).
• Improvement in quality of life in urban and rural areas.
Aims and Objectives

- To identify all the factors that affect housing affordability and the relationships that exist among them.
- To identify at least 2 Innovative Building Technologies and carry out an effective analysis of these technologies so as to infuse them into the low income subsidy programs in South Africa.
Housing Affordability

• The ability of a household to secure some given standard of housing at a price or rent which does not impose, in the eyes of some third party an unreasonable burden on household incomes (Maclennan & Williams 1990: 9)

• Who sets the standard?...minimum dwelling size and conditions…Government (Development codes)

• When does the burden become unreasonable to households…when it infringes upon the acceptable minimum non housing expenses for that household
Methods: 1. Percentage of income

- A fixed percentage is taken as a standard that is multiplied by the household income to determine how much of the income is available for the household to spend on housing.

**It has some shortcomings:**
- There are unfair effects of the income constraints arising due to fixed percentage application on incomes
- No specification of types of incomes used.
- Household neighbourhood preferences ignored
- No preferences set for other commodities
- Not applicable during entire household lifecycle
- Fails to track affordability changes due to property value changes with time

(Bogdon & Can, 1997; Thalmann, 2003; Chen, 2007)
Methods: 1. Percentage of income

Borrowing constraints method (Bourassa, 1996)

Mortgage underwriting criteria.

\[ W \geq D ; \quad D \geq iV \quad \text{(1a)} \]

Income constraints method

\[ PY \geq (V - D) \left( \frac{r}{1 - \frac{1}{(1 + r)^n}} \right) \quad \text{(1b)} \]

For analysis, we shall compute the statistic below:

\[ PY - \left\{ (V - D) \left( \frac{r}{1 - \frac{1}{(1+r)^n}} \right) \right\} \quad \text{(1c)} \]
Methods: 2. Household based lifecycle measurements

Owner Occupier:
- \( y(i) - \{mh(i) + \left[1 - tx(i)\right].(mg(i) + h(i)) + d(i) + mt(i) + ins(i) - g(i)\}.v(i) \geq 0 \quad ; \quad D \geq r.V \) (2)

Renter Occupier:
- \( y(i) - \{mh(i) + [mg(i) + h(i) + d(i) + mt(i) + ins(i) - g(i)].v(i) - \left[e.tx(i).\frac{v(i)}{1-tx(i)}\right]\} \geq 0 \) (3)
- Can be used to track affordability, tenure choice preferences and movement changes with respect to time.
  (Brueckner, 2011: 120-136; Bourassa, 1996)

- Housing unit value “v” also has an influence on affordability; Has a direct influence on other housing expenses.
Advantages

• Takes into account the differing household sizes and incomes
• Eliminates the unfair effects due to income constraints
• Can allow for household neighborhood preferences
• Can allow for preferences for other commodities to be set
• Can track house affordability changes with time
• Considers household lifecycle
• In its improved state it can modeled so that it takes into account the spatial dimension, hence spatially based analysis
Methods: 2. Household based lifecycle measurements

- Housing unit value (V) with respect to time can also be estimated (cost approach to valuation) using the following equation (Maritz, 1993: 110):

\[ V = cc - d + l \]  \hspace{1cm} (4)

- “cc”...Initial construction costs to build the housing unit also significantly influence the value of the unit later.
- Initial construction costs – directly influenced by the building technologies
Building Technologies

4 Technologies chosen:
- Abode technologies
- Moladi walling and building systems
- National Overseas and Modular Construction
- Robust walling and building systems

Table 1a: Building technology types

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<td>9</td>
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<td>YES</td>
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<td>YES</td>
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<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>1163.51</td>
<td>9</td>
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<td>YES</td>
<td>YES</td>
<td>6018.18</td>
<td>7</td>
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</table>
### Table 1b: Subsidy Grant Levels

<table>
<thead>
<tr>
<th>Subsidy Program</th>
<th>Maximum amount (2018/2019)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IHS</strong>: Individual Housing Subsidy</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>IRDP</strong>: A Grade Services</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>IRDP</strong>: B Grade Services</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>CS</strong>: Consolidation Subsidy</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>IS</strong>: Institutional Housing Subsidy</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>EPHP</strong>: Enhanced People’s Housing Program</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>RHS</strong>: Rural Housing Subsidies</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>FRHS</strong>: Farm Residents Housing Subsidies</td>
<td>R 116,867.00</td>
</tr>
<tr>
<td><strong>DWH</strong>: Disabled Wheelchair House</td>
<td>R 172,929.00</td>
</tr>
<tr>
<td><strong>MVH</strong>: Military vets House</td>
<td>R 199,014.00</td>
</tr>
<tr>
<td><strong>TSH</strong>: Temporary shelter</td>
<td>R 57,790.00</td>
</tr>
<tr>
<td><strong>RH</strong>: Replacement of houses</td>
<td>R 115,568.00</td>
</tr>
</tbody>
</table>
Diagrammatic Representation
Methodology

(4 technologies analyzed for affordability over the various low income housing grant levels)

Analysis 1: Statistic = (Subsidy grant level – Construction technology cost to Build)

Result 1

Non-Affordable technologies (Non-Credit linked)

Affordable technologies (Credit linked)

Analysis 2: Statistic = Modified income criterion statistic

Result 2

Non-Affordable technologies (Credit linked)

Affordable technologies (Credit linked)

N/A
Results: Analysis1 (Figure1)
Results: Analysis 1 (Developer’s Profit = 20%)

Table 2: Ranking of the building technologies over non-credit linked subsidies

<table>
<thead>
<tr>
<th>Position</th>
<th>Technology (For Non-Credit Linked Subsidies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moladi_C</td>
</tr>
<tr>
<td>2</td>
<td>Moladi_A</td>
</tr>
<tr>
<td>3</td>
<td>Robust_C</td>
</tr>
<tr>
<td>4</td>
<td>Robust_A</td>
</tr>
<tr>
<td>5</td>
<td>Abod</td>
</tr>
<tr>
<td>6</td>
<td>Robust_B (Disabled Wheel chair &amp; Military Vets)</td>
</tr>
</tbody>
</table>
Results: Analysis 1 Graphical representation of rankings (Figure 2)

- Replacement of houses
- Temporary shelter
- Military vets House
- Disabled Wheelchair House
- IHS, IRDP, CS, IS, EPHP, RHS, FRHS
<table>
<thead>
<tr>
<th></th>
<th>MOLADI_A</th>
<th>MOLADI_B</th>
<th>MOLADI_C</th>
<th>ROBUST_A</th>
<th>ROBUST_B</th>
<th>ROBUST_C</th>
<th>ABODE</th>
<th>NATIONAL OVERSEAS MCT_A</th>
<th>NATIONAL OVERSEAS MCT_B</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHS, IRDP, CS, IS, EPHP, RHI, FRHS</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Disabled Wheelchair House</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Military vets House</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Temporary shelter</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>5</td>
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<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Replacement of houses</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
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</tbody>
</table>
Results: Analysis 2

Table 4: Affordability ranking of technologies for credit linked subsidies

<table>
<thead>
<tr>
<th></th>
<th>MOLADI_A</th>
<th>MOLADI_B</th>
<th>MOLADI_C</th>
<th>ROBUST_A</th>
<th>ROBUST_B</th>
<th>ROBUST_C</th>
<th>ABODE</th>
<th>NATIONAL OVERSEAS MCT_A</th>
<th>NATIONAL OVERSEAS MCT_B</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHS, IRDP, CS, IS, EHP, RHS, FRHS</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Disabled Wheelchair House</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Military vets House</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Temporary shelter</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Replacement of houses</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5: Performance of building technologies with respect to credit-linked subsidies.

<table>
<thead>
<tr>
<th>Position</th>
<th>Technology (For Credit-Linked Subsidies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Robust_B</td>
</tr>
<tr>
<td>2</td>
<td>Mboladi_B</td>
</tr>
<tr>
<td>3</td>
<td>National Overseas MCT_A</td>
</tr>
<tr>
<td>4</td>
<td>National Overseas MCT_B</td>
</tr>
</tbody>
</table>
Results: Analysis2 Graphical representation of rankings (Figure 3)

Replacement of houses
Temporary shelter
Military vets House
Disabled Wheelchair House
IHS, IRDP, CS, IS, EPHP, RHS, FRHS

Legend:
- NO_MCT_B
- NO_MCT_A
- ABODE
- ROBUST_C
- ROBUST_B
- ROBUST_A
- MOLADI_C
- MOLADI_B
- MOLADI_A
Table 6: Summary of effectiveness of the innovative construction technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Is it Credit Linked?</th>
<th>Subsidy Programs Applicable</th>
<th>Technology</th>
<th>Is it Credit Linked?</th>
<th>Subsidy Programs Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOLADI_C &amp; EPHP</td>
<td>NO</td>
<td>All except Temporary Shelter (TSH)</td>
<td>MOLADI_B</td>
<td>NO</td>
<td>Disabled &amp; Military Veterans (Developer profit &lt;20%)</td>
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<tr>
<td>MOLADI_A &amp; EPHP</td>
<td>NO</td>
<td>All except Temporary Shelter (TSH)</td>
<td>ROBUST_B</td>
<td>YES</td>
<td>All Except Disabled, Military Veterans, and Temporary Shelter</td>
</tr>
<tr>
<td>ROBUST_C &amp; EPHP</td>
<td>NO</td>
<td>All except Temporary Shelter (TSH)</td>
<td>MOLADI_B</td>
<td>YES</td>
<td>All Except Disabled &amp; Military Veterans and Temporary Shelter (Developer profit &gt;19%)</td>
</tr>
<tr>
<td>ROBUST_A &amp; EPHP</td>
<td>NO</td>
<td>All except Temporary Shelter (TSH)</td>
<td>NOMCT_A &amp; EPHP</td>
<td>YES</td>
<td>All Except Temporary Shelter (TSH)</td>
</tr>
<tr>
<td>ABOD</td>
<td>NO</td>
<td>All Especially Temporary Shelter</td>
<td>NOMCT_B</td>
<td>YES</td>
<td>All Except Temporary Shelter (TSH)</td>
</tr>
<tr>
<td>ROBUST_B</td>
<td>NO</td>
<td>Disabled &amp; Military Veterans</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary of effectiveness...continued
Conclusions

- Need to address weaknesses in the percentage of income method
- Thus need for lifecycle evaluation of housing affordability
- Application of EPHP into the various building technologies improves affordability for the year 2018, and for some time (years) into the future.
Further research

- Modelling and implementation of the method that measures housing affordability by using lifecycle based household profile data.
- Using the developed model to forecast of the performance (In terms of affordability) and suitability of all the approved innovative building technologies in South Africa
References Used


References Used


END