A participatory design approach to the wicked problem of designing sustainable communities

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ABSTRACT

Legislative mechanisms from the Localism Act in the UK, provide opportunities for communities to explore their future development aspirations through ‘neighbourhood planning’. The legislation assumes that non experts in dynamic and informal community systems will be able to: engage their community; capture their requirements; and develop and fund a plan that is representative of the needs of the community, this presents a series of challenges. Rittel and Webber have referred to this type of social policy challenge as a ‘wicked problem’.

Ackoff’s three rules for participation state that: participation needs to make a difference for the participants; that implementation of the results should be likely; and finally that it should be fun to participate. We identify the components of sustainable communities and investigate approaches including community engagement and community led planning as well as participatory design games and a new approach of science fiction prototyping (SFP). SFP provides an approach to encourage participation and increase engagement that is fun and creative. We identify the system requirements for an appropriate approach to address the wicked problem of designing a participatory system in the context of localism. Finally we present the approach and discuss its potential and limitations.

Keywords:
Sustainable communities, participatory design games, science fiction prototyping, wicked problems,

1. INTRODUCTION

The Localism Act 2011 provides legislative mechanisms to enable communities to explore their future development aspirations through ‘neighbourhood planning’. Neighbourhood plans are drawn up by local stakeholders in ‘neighbourhood forums’. If the plan is agreed at a community referendum, it is then in place for 10 years. Therefore if a community could develop a vision for its future it would be possible to get it considered in future development decisions. However we identify a number of barriers for the community to overcome before they can put their plan forward at referendum.

The paper is organised around an exploration of three of those challenges. The first challenge is that planning is a ‘wicked problem’, meaning that its formulation, end point, solution, or
cause cannot be defined in advance (Rittel and Webber, 1973). The second challenge concerns how to support the flat hierarchies of communities to: agree on the aim of the plan; participate in its design; and produce a single representative vision that is sustainable and represents the needs of the community. For this second challenge we introduce a number of approaches including participatory design. The final challenge is that the goal of creating sustainable communities is itself vague. We draw from a meta-analysis of sustainable community literature the key characteristics of sustainable communities. From these characteristics we propose a series of system requirements. Finally the system requirements are then used to propose a participatory design tool to support neighbourhood forums to design sustainable communities.

2. SUSTAINABLE COMMUNITY

In order to define what a sustainable community is, we first examine the related notion of sustainable development. Sustainable development is commonly thought to be defined by the ‘Bruntland definition’, originally expressed as ‘...development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987). However the Bruntland definition is vague, which Bridger and Luloff (1999) argue accounts for its popularity in policy documents. This means that we need a definition to provide guidance for how sustainability can be achieved. From the sustainable development literature, two distinct camps for how sustainability can be achieved emerge: the constrained growth definition and the resource maintenance definition. In the constrained growth definition ‘growth’ is still the primary objective, whereas in the resource maintenance example ‘the maintenance of existing and future resources’ is given priority over continued growth (Bridger and Luloff, 1999).

There are many arguments for addressing sustainability at the local level, the first being that it is less problematic than defining sustainability actions at a national level; that changes are more tangible to the community and felt in a more immediate manner; and finally that working at the local level provides a plurality of possibilities to develop concrete examples (Bridger and Luloff, 1999). However working at the local level could also make it more difficult: to assess the impact of multiple differentiated plans at a national level; for projects to gain support; and reduce the recurrence of mistakes. Therefore whilst sustainable communities provide a good approach to sustainable development they require support to achieve their potential.

We propose to develop a tool to support the design of sustainable communities: in order to do this, we first need to establish the system requirements. From a meta-analysis of sustainable community articles we extract a set of sustainable community characteristics. We then use these characteristics to propose a set of system requirements from which we can propose the architecture for our tool. The meta-analysis concentrates on peer reviewed papers with 10 or more citations that have sustainable community in the title. From our analysis, we have identified the following eight characteristics that could be used individually or collectively to design sustainable communities (Table 1).
<table>
<thead>
<tr>
<th>#</th>
<th>Characteristics</th>
<th>Explored in</th>
<th>Requirements for sustainable communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local food systems</td>
<td>Feenstra (2009)</td>
<td>Identify leaders Collaboration support and diversity / inclusivity Fostering the politics of civil renewal</td>
</tr>
<tr>
<td>2</td>
<td>A reduction in the use of energy / community generated renewable energy</td>
<td>Petkov et al. (2011)</td>
<td>the extent to which the technology motivates users to reduce their energy use Awareness of the energy use of others in the community is a potential change motivator</td>
</tr>
<tr>
<td>3</td>
<td>Community economic development (CED)</td>
<td>Roseland (2000)</td>
<td>A process by which communities can ‘Build long term community capacity and foster the integration of economic, social and environmental objectives’</td>
</tr>
<tr>
<td>4</td>
<td>Sustainable community indicators</td>
<td>Innes and Booher (2000)</td>
<td>Indicators should be customised for each place.</td>
</tr>
<tr>
<td>5</td>
<td>Making an explicit and visible relationship to global sustainability</td>
<td>Innes and Booher (2000)</td>
<td>Innes and Booher imagine a distributed intelligence where all stakeholders are provided with a flow of meaningful information and the opportunity for joint learning to understand feedback from the environment and other changes</td>
</tr>
<tr>
<td>6</td>
<td>The result should be greater than the sum of its parts</td>
<td>Roseland (2000)</td>
<td>The development of a vision of the community that represents a better way of life and not just a reduction in energy etc.</td>
</tr>
<tr>
<td>8</td>
<td>The future of work</td>
<td>Roseland (2000)</td>
<td>Expanding the availability of information technologies</td>
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</table>

Table 1. The characteristics of sustainable communities derived from a meta analysis of the sustainable community literature.

Roseland (2000) acknowledges that whilst there are many definitions of sustainable communities there is no accepted single definition. Innes and Booher (2000) see sustainable communities as the result of distributed intelligence where all stakeholders with different interests and values are provided with a flow of meaningful information and the opportunity for joint learning to understand feedback from the environment and other changes. Roseland sees the ‘dilemma [as] how to encourage democracy (e.g. participatory local processes) within a framework of sustainability’. Roseland proposes a framework for sustainable community development, which includes four elements:

- minimizing consumption of essential natural capital
• multiplying social capital  
• more efficient use of urban space  
• Coordinating and balancing the other three elements

Innes and Booher, (2000) remind us that there are also challenges to designing sustainable communities, which include the idea that narrow economic interests are likely to dominate the perspective of communities. However the strongest argument for focusing on sustainable communities are the democratic advantages to empowering citizens through increased decision making capability increasing the support capacity of the community by making new support networks within the community. For instance, Gibbs (1994) presents an argument for a community-level approach that allows for the design of policies and practices that are sensitive to the opportunities and constraints inherent to particular places. Gibbs (1994) definition of sustainable community development states that it ‘would require [a] devolution of decision-making authority to the local level’. Gibbs (1994) emphasise the role of the community in supporting global sustainable development. Some of the aspirations expressed by Gibbs have the potential to be satisfied using the legislative mechanisms of the Localism Act. Pigg and Crank (2004) argue that the deployment of ICT can result in the increased social capital which is required by Roseland’s framework. However community groups are unlikely to have the skills and or resources to deploy the collaborative ICT systems this would require (Merkel et al. 2004). Therefore in the following section we propose an approach to developing a tool which could support users to design sustainable communities.

3. PARTICIPATORY DESIGN FOR SUSTAINABLE COMMUNITIES

Gibbs and others outline the potential for a community level approach to sustainable development. Roseland (2000) presents a framework for designing sustainable communities that consists of four elements and views the main challenge as how to encourage democracy by supporting participatory local processes. It is also clear that it will not be possible for the neighbourhood plan to succeed at the referendum stage if the community has not been consulted in the process. Therefore we need an approach to developing our tool that will encourage community members to participate.

A field that has explored the involvement of participants in the design of new systems and solutions is participatory design. Participatory processes are commonly represented by Arnstein’s ‘Ladder of Citizen Participation’ (Arnstein, 1969). The rungs of ladder represent the level of participation and are primarily divided, in ascending order, into nonparticipation, tokenism and citizen power. Ackoff’s three rules for participation from 1974 state that for participation to be successful (and therefore reach the upper rungs of Arnstein’s ladder): the participatory design needs to make a difference for the participants; that implementation of the results should be likely; and finally that it is fun to participate (Ehn and Sjögren, 1991). It is this last rule that informs the focus of our approach, and guides our exploration of the potential of participatory design in supporting the design of sustainable communities. We assess the system requirements presented by the sustainable community characteristics against the capabilities of a series of approaches from participatory design. Different stakeholders will have different views of what sustainable communities are. We aim to
support the communities to develop visions of their future, it is therefore important that they establish a common understanding among the stakeholders at the earliest stage of the design. However, this is complicated by the nature of the problem of planning for sustainable communities. Rittel and Webber (1973) defined 10 distinguishing properties of wicked problems: we highlight some of the properties and suggest some approaches to address them.

1. There is no definitive formulation of a wicked problem
2. Wicked Problems have no stopping rule
3. Solutions to wicked problems are not true-or-false, but good-or-bad
4. There is no immediate and no ultimate test of a solution to a wicked problem
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan
7. Every wicked problem is essentially unique
8. Every wicked problem can be considered to be a symptom of another problem
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution
10. The planner has no right to be wrong

Property 8 is particularly problematic to sustainable communities as we know that one of the major problems of collaborative working with multidisciplinary stakeholder is that each group may have a different perception of the origins of a problem. This may make it difficult for the aim of the community plan to be agreed and could mean that more effort is required in the early stages of design in order to establish what problems the plan should address.

Our focus on a participatory design approach to the challenge of designing sustainable communities provides us with a number of avenues to explore. Ackoff’s third rule of successful participation which requires that participation should be fun has been explored in the participatory design literature in the form of participatory design games (Brandt, 2006). However paradoxically the utilisation of design games in participatory design are not always employed for their potential to make participation fun, but instead for the characteristic of design games to generate ‘game artefacts’ which can be used to capture the requirements of the users.

An example of using game artefacts in the participatory design process is in the practice of science fiction prototyping (SFP), SFP is an approach that enables users to explore complex and unpredictable future scenarios. SFP works by constructing a science fiction narrative containing both the science fact that we know brought to life by the science fiction for future elements that we can’t be sure of. The justification is that although it creates a fantastical scenario, it provides the user, when mixed with real science, a flexible approach to visualise and explore consequences of events and actions creatively (Johnson, 2011).
4. SYSTEM REQUIREMENTS FOR SUSTAINABLE COMMUNITY COMPONENTS

Having identified the components of sustainable communities (Section 2), we explore the context and system requirements for each characteristic. We then synthesise our approaches to the appropriate characteristic to develop a design for a new approach to supporting communities to design sustainable communities. The proposed system will represent the characteristics of sustainable community to a user enabling them to choose which characteristics to include in their design. Therefore in order to design the system we first need to analyse the requirements. Table 2 describes the system requirements for each characteristic.

<table>
<thead>
<tr>
<th>#</th>
<th>Characteristic</th>
<th>Context</th>
<th>System requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local food systems</td>
<td>NLUD (National Land Use Database) for the UK</td>
<td>Enable the user to propose land for local food production</td>
</tr>
<tr>
<td>2</td>
<td>A reduction in the use of energy / community generated renewable energy (CGRE)</td>
<td>Extension of the South Bank CHP example (SBEG, 2009)</td>
<td>Enable the user to propose new CHP and CGRE</td>
</tr>
<tr>
<td>3</td>
<td>Self reliance / autonomy / democratic participation</td>
<td>multiplying social capital (Roseland, 2000) through increased participation</td>
<td>Provide a democratic decision support tool to assist communities to develop their own sustainable future plans</td>
</tr>
<tr>
<td>4</td>
<td>The future of work</td>
<td>Community members who work remotely</td>
<td>Allocation of communal remote working facilities</td>
</tr>
<tr>
<td>5</td>
<td>Community economic development (CED)</td>
<td>Based on 1,2,3 and 4</td>
<td>Provide the community with a marketplace to sell the food and distribution of the energy they produce.</td>
</tr>
<tr>
<td>6</td>
<td>Sustainable community indicators</td>
<td>Data on the existing community indicators possibly taken from the EC common indicators (EGUE, 2000)</td>
<td>Present the community with a visualisation of the changes 1,2,3,4 and 5 could make to their community</td>
</tr>
<tr>
<td>7</td>
<td>Making an explicit and visible relationship to global sustainability</td>
<td>Based on 6</td>
<td>Provide users with feedback on the effect their proposals could make both locally and nationally if others followed a similar example</td>
</tr>
<tr>
<td>8</td>
<td>The result should be greater than the sum of its parts</td>
<td>Capture the requirements of the user to ‘make life in their community better’</td>
<td>The development of a vision of the community that represents a better way of life and not just a reduction in energy etc.</td>
</tr>
</tbody>
</table>

Table 2. The system requirements for the characteristics of sustainable communities

This enables us to propose the following approach based on the dependency established in Table 2 (see Table 3). In table 3 it is possible to see the relationship between the layers and the idea that components in the bottom layer of the model could be added to or removed without altering the rest of the diagram.
The result should be greater than the sum of its parts (8)
Making an explicit and visible relationship to global sustainability (7)
Sustainable community indicators (6)
Community economic development (CED) (5)

<table>
<thead>
<tr>
<th>Local food systems (1)</th>
<th>Energy use reduction / community generated renewable (2)</th>
<th>Self reliance / autonomy / democratic participation (3)</th>
<th>The future of work (4)</th>
</tr>
</thead>
</table>

Table 3 The proposed architecture of the sustainable communities system featuring a reconfigurable bottom layer.

Innes and Booher (2000) recommend that community indicators should be flexible to the needs of the community therefore the measurable output of the components on the bottom layer should be flexible and adaptable to the needs of each community. Table 3 provides a diagram of how information could flow up through the system. For instance, taking the example of science fiction prototyping, we could imagine that the system could support the user to develop a narrative based on a set of pre-programmed scenarios. This could be achieved by applying a series of scenarios to the bottom layer components whose implications could be explored through the upper level components in the system. The tool could present the user with graphical representations of the sustainable community characteristics, the user could then choose through a drag and drop interface which bottom layer characteristics to include in their design and receive feedback on the sustainability consequences of their decisions. Above the interchangeable bottom layer we have a set of fixed modules that: in response to Innes and Booher (2000) concern for the dominance of narrow economic interests, calculate the impact of the design on the economy of the community (5); assess the sustainability of the choices made by the user (6 and 7); and finally 8 presents the user with a visualisation of their design choices. 8 informs the user of why their choices are relevant to them and how they will ‘make their life better’.

5. DISCUSSION

Our premise for investigating a system to support the design of sustainable communities was that legislation in the Localism Act provides a framework for the communities to develop visions of the future but not the tools to do so. We have identified that communities will be challenged to: agree on the aim of the plan; participate in the design of the plan; and produce a feasible plan that is sustainable and representative of the needs of the community. Our approach presented in table 3 suggests that there is potential for a participatory design approach to address the wicked problem of designing sustainable communities in the context of the localism Act. However our approach also has limitations: using pre-programmed scenarios provides focus to the conversation but also limits it. This could lower the level of participation as measured on Arnstein’s ladder. This would risk the users feeling disengaged if they perceive the process to be tokenistic because options that they feel are relevant are not included. This also poses a danger of breaking Ackoff’s third rule of participation: that participation should be fun. A possible solution for this would be to enable the community to develop their own objects and attract support; however there is a risk that this could detract...
from the sustainable community development focus of the tool. It is important to state that the nature of wicked problems means that they are inherently ‘unsolvable’, therefore the flexible approach documented here should provide neighbourhood forums with a much needed opportunity to understand and engage with the sustainability challenges our communities face and capture their responses in game artefacts.

6. CONCLUSION

We have presented a participatory design approach to support neighbourhood forums to design sustainable communities. Based upon analysis of the characteristics of sustainable communities and the requirements for a system to support these characteristics, we identified that a process with elements of games, that is relevant to the needs of the community has the potential to engage participants to explore their vision of their sustainable community. One of the emerging approaches identified that support such a process is science fiction prototyping (SFP). Whilst SFP does not necessarily reflect the common and agreed view of the future scenario, there is reported evidence that it encourages users to participate by providing a process that is relevant and engaging. SFP is therefore proposed to be used in both the stage of defining the aim of the plan and also in final stage to support the users to develop their ideas for the future of their communities. Furthermore, a system architecture was derived based on sustainable community characteristics to support the participatory process. The system architecture also contains a community economic development layer to encourage the user to participate by providing the participants with a design process from the perspective of the economy of the community. This architecture is expected to lead to a set of tools that would support the participants to design a single collective vision of their community. The vision would be composed from a bank of sustainable community approaches that were woven together by a unique narrative generated by the community using SFP.

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