Community Directed School Infrastructure Development in Vanuatu

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Abstract

The demand for primary level education in Vanuatu continues to rise driven by strong population growth and the introduction of fee-free schooling. This in turn places pressure on supply side educational requirements, of which school infrastructure is a significant one, and more broadly places achievement of relevant Millennium Development Goals at risk. School infrastructure includes classrooms, toilets, staff houses, dormitories, furniture etc.

The commonly used method for the provision of school infrastructure in Vanuatu is through a centralised (inside out) model implemented by the Ministry of Education, with international donor support. However, geographical and institutional constraints has resulted in an under supply of school infrastructure which is unable to meet increased demand for education.

As a result, a community directed school infrastructure pilot program was implemented in 2011/12, with the objective being to trial an alternative (outside in) delivery mechanism. In addition, a refined building design, which more aptly captures local knowledge, skill and maintenance requirements was developed, whilst retaining some deference to “imported” disaster risk reduction engineering principles. With support from the Ministry of Education and Donors, the new “hybrid” classroom building was constructed by “the community” of Takara, on Efate Island, Vanuatu and opened in May 2012.

This paper documents the rationale and implementation of the project, concluding that it represents a realistic methodology to address required school classroom provision in Vanuatu.

Keywords: Vanuatu, School Infrastructure, Community Directed Development, Hybrid

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1 Introduction

Increasing demand for primary level education in Vanuatu is being driven by strong population growth and the introduction of fee-free schooling. This demand is placing pressure on supply side educational requirements, including infrastructure. It estimated that some 200 school classrooms per year are required to be either refurbished or reconstructed to keep pace with enrolment demand. Whilst this figure has not been verified, it is clear that the current output of classrooms (approximately 30 – 40 per year) will not cater for this demand. Further, the current double classroom block design reinforced concrete is comparatively slow and expensive to build.

2 Current Method of Education Infrastructure Delivery

The design and delivery of school infrastructure in Vanuatu is the responsibility of the Ministry of Education (MoE). A standard double classroom design is used throughout the country. This design comprises a reinforced concrete frame with solid concrete block infill walls, and a timber framed metal deck roof. The MoE utilises a centralized approach to school infrastructure delivery throughout Vanuatu. Historically, this has operated with the MoE procuring materials centrally and distributing them to school sites on an "as needed" basis. Installation of the materials is in turn done by local contractors whom are sourced through competitive local bidding. This is essentially an "inside-out" control paradigm of infrastructure delivery which broadly places the Authorities at the centre of delivery, and communities at the periphery as per Figure 1 below.

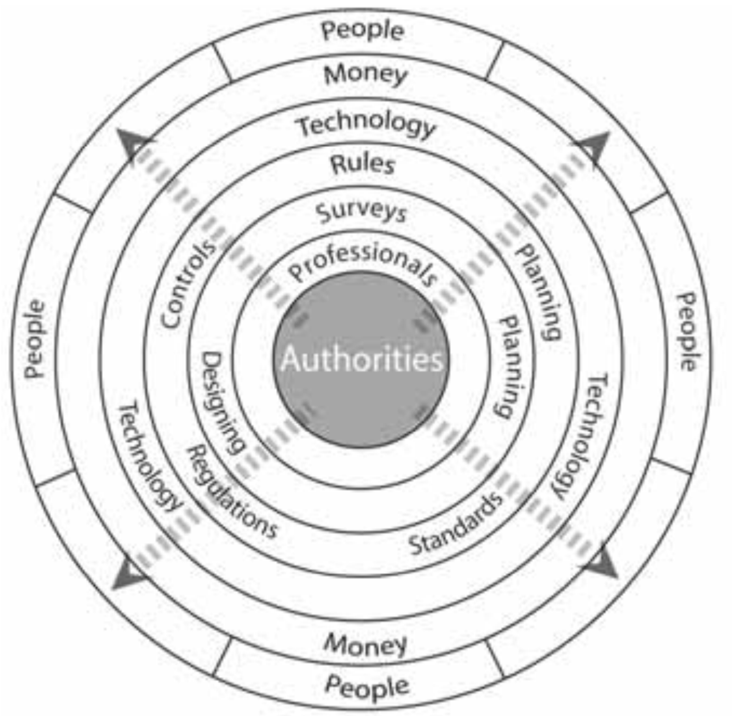

Figure 1: The Control Paradigm of Infrastructure Delivery (Lankatilleke 2010)

However, institutional capacity constraints (predominantly in the form of human resourcing) associated with this method of delivery currently result in an undersupply of classrooms (approximately 30-40 per year), which clearly will not deliver the identified required output of 200 classrooms per year as stated above. As such, an alternative approach to school infrastructure procurement is required.

3 A Community Driven Development Approach

A Community Driven Development approach (CDD) is an alternative procurement option which has been used successfully in the Pacific (Lawther 2009), South Asia (Edstrom 2002, World Bank 2003), as well as a number of African countries (Theunynck 2009) to deliver school infrastructure on a large volume basis.

CDD essentially decentralizes the provision of school infrastructure from the MoE to the communities. The emphasis shifts from the current government provision of infrastructure to the community, to the community provision of infrastructure. In practice, the community is paid a stage based grant to deliver a facility that they identify as necessary for their local school, within an holistic school development plan. CDD leverages off existing capacities within communities and provides the necessary resources (usually money and technical expertise) to augment these capacities. In addition, communities are encouraged to think strategically about the immediate and longer term infrastructure requirements for their schools. Such an approach is commensurate with accepted development theory (Chambers 1997) which seeks to empower communities to identify and achieve their own development objectives, and thus delivery infrastructure through an outside in, or support paradigm, as shown in Figure 2 below.

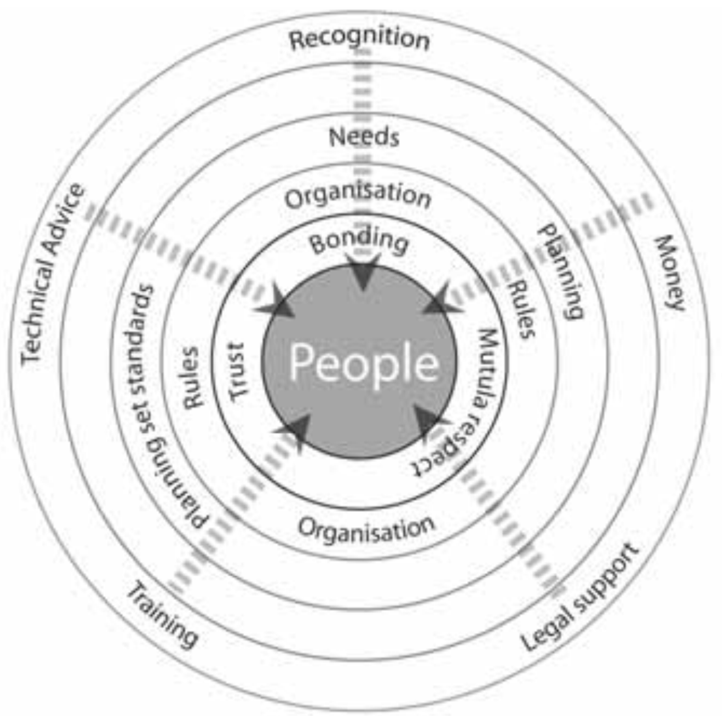

Figure 2: The Support Paradigm of Infrastructure Delivery (Lankatilleke 2010)

International experience (World Bank 2003) has shown that the transfer of responsibility from government to community for the delivery of small scale infrastructure, such as school buildings;

- leads to substantial cost-savings, community empowerment and ownership, increased speed of the execution of large programs of scattered small facilities, and in the case of school construction, increased participation of the community in the school life.
- community-based contracting is feasible and particularly desirable in remote areas.
- Governments consistently underestimate the capability of rural communities to mobilize and manage projects. Nonetheless communities need properly targeted mobilization and support, in order to succeed.

In addition, a CDD approach to school construction typically delivers the following benefits (Lawther 2009):

- reduced costs, through the increased use of lower cost rural labor, material and
- management capacities.
- greater maintainability, as the skills and materials needed to maintain the building are both sourced and developed locally.
- greater ownership, as the community sees the finished building as something they created rather something belonging to the Government.
- greater empowerment, as Villages successfully undertake the task of producing quality school buildings.
- better dialogue and relationships between Government and Village, through the process of working together.
- great economic benefits, as more of the work and money associated with school infrastructure investment flows through the Village, rather than directly to urban contractors and suppliers.

Success of CDD (World Bank 2003) depends upon the following principles:

- Investment in an awareness program to socialize the concept of CDD within communities.
- Use of local knowledge and having the local community participate in the design and ongoing review of the program.
- Working within existing community governance structures.
- Paying the community properly for the service they render the Nation through managing the construction of schools.
- Proper investment in the planning and management of the program.
- Use of financial incentives so that producing school buildings that are well built, and built quickly, delivers the greatest rewards for the community.
- Use of pro-active Quality Assurance systems that prevent mistakes before they happen, and help the communities to succeed, rather than identifying mistakes after the fact.

- Develop designs that are appropriate and attuned to the local skills and materials base, for ease of local production.
- Delegation of responsibility. It is better to give the community too much responsibility, and later pull back, than to be timid, and never know how much they are capable of.
- Maintaining simplicity by using minimum paperwork and procedures at the community level.
- Ensuring transparency and accountability by all members of the community being aware of where and how the finances are being spent.

Thus a CDD approach to the delivery of school infrastructure was piloted. This pilot required the design and construction of a “hybrid” classroom building. This is now considered.

4 The Hybrid Design

The overarching design philosophy of the project was to involve the local community as much as possible. This required the use of local materials to the full extent possible, coupled with the integration of discreet specific “western” seismic and anchoring details. This fusion of local and external technologies gave rise to the “hybrid” nomenclature”. The spatial layout of the classroom building was based upon the MoE’s existing double classroom layout, but with scalable flexibility as shown in Figure 3 below. In this sense the floor plan replicated the existing classroom facility.

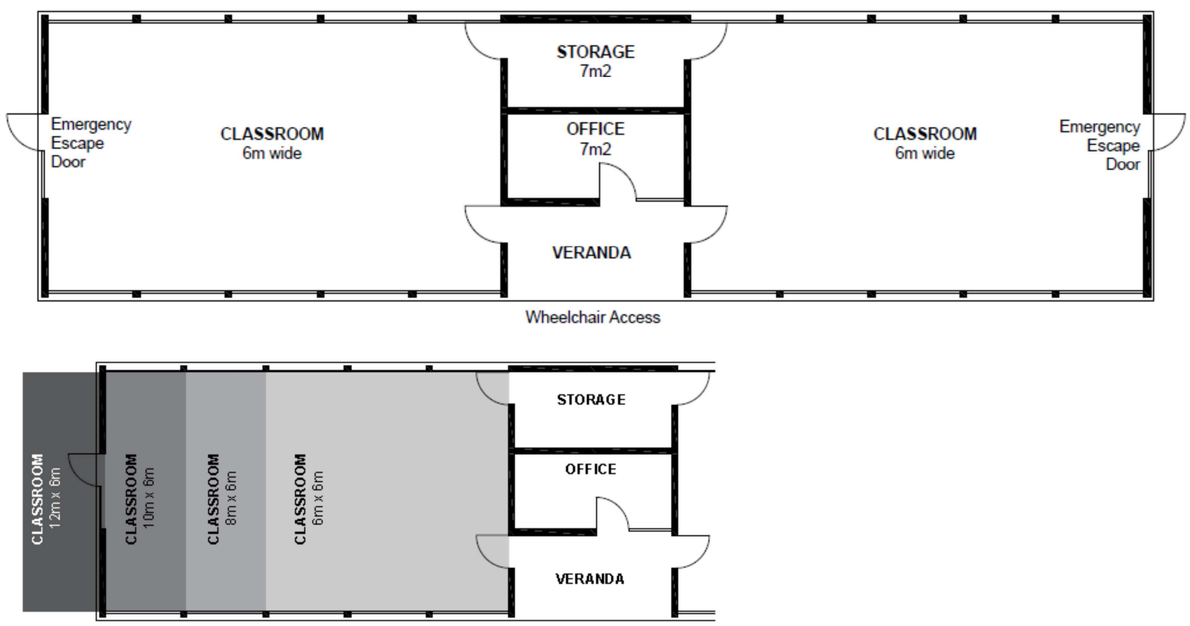

Figure 3: Hybrid Building Floor Plan (Source: Kaunitz 2011)

However, the reinforced concrete frame was replaced with a timber frame to facilitate the use of local materials in construction. Structural connection and tie downs were included for earthquake and cyclone resilience (hence the term “hybrid). Design options considered and chosen by the community included:

- the type of flooring being either reinforced concrete slab, or traditional crushed coral. The community chose reinforced concrete.
- the type of walling infill panels, such as timber or stone. The community chose local stone.
- the type of roofing, typically either metal deck roof sheeting, or traditional thatch. The community chose thatch on the basis of its deference to traditional local building design. This was interesting as metal sheeting is often considered as having lower maintenance requirements (Lawther 2009).

Additional consideration was also given to lighting and ventilation to facilitate user comfort as shown in figure 4 below.

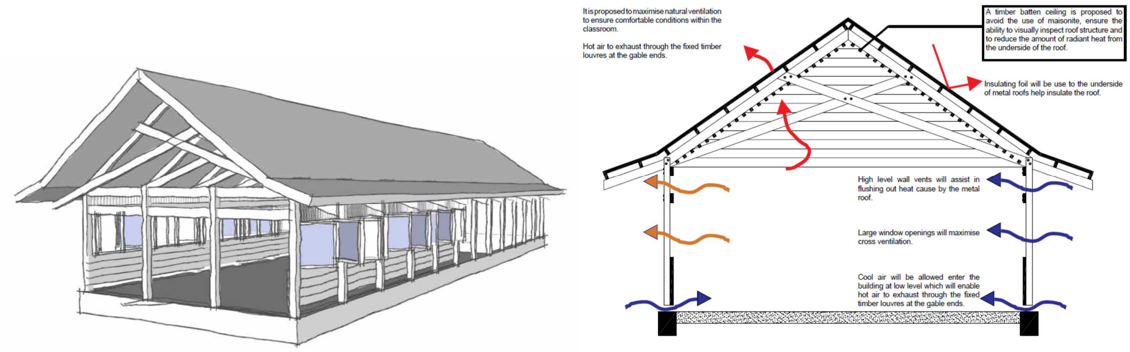

Figure 4: Lighting and Ventilation considerations (Source: Kaunitz 2011)

A comparison of salient design features between the pre-existing reinforced concrete frame and the hybrid design is shown in table 1 below:

Table 1 – Comparative Design Features (Source: Lawther 2011)

Design Parameter	Reinforced Concrete	Hybrid
		
Internal Floor Area	144 m2	151 m2
Internal Classroom Floor Area	121 m2	116 m2
Internal Office / Verandah / Storage Floor Area	21 m2	33 m2
Classroom Ventilation Area	30 m2	97 m2
Classroom Lighting (window) area	30 m2	35 m2
Ventilation to Classroom Floor Area Ratio	0.25	0.84
Lighting to Classroom Floor Area Ratio	0.25	0.30
Floor to Truss Chord Height	2.6 m	2.4 m

From Table 1 above, the following can be gleaned:

- The hybrid design is approximately 5% larger than the reinforced concrete design in terms of internal floor area.
- The hybrid design has approximately 4% less classroom area than the reinforced concrete design. However, the hybrid has a separate common classroom storage area, which should assist user efficiency of classroom space utilization, as items will be capable of being stored adjacent to, rather than within, the classroom.
- The hybrid design is approximately 50% larger in terms of the office, storage, verandah area.
- The ventilation area provision of the hybrid design is approximately 3 times that of the reinforced concrete building, and should provide greater thermal comfort for users.
- The lighting area provision of the hybrid is approximately 20% greater than the reinforced concrete building, and should provide enhanced visual comfort for users.

- The floor to truss height of the hybrid design (at the external wall) is 200mm lower than the reinforced concrete building. Whilst the hybrid design roof is therefore effectively 200mm closer to users, and some impact upon thermal comfort might be expected, it is considered that this will be compensated for by the significant increase in ventilation provision, as above. In addition, a thatch roof covering (if chosen) will also assist in defraying any adverse thermal impact.

5 Construction

The construction of the hybrid building was undertaken by the community of Takara, Efate island. This community was chosen as they expressed interest in undertaking the project, and were within proximity of MoE and donors (approximately 1 hour from Port Vila). In order to simplify the piloting process, it was decided to use milled timber sourced from Port Vila, rather than milled on site, which is the ultimate objective of the CDD, particularly given the importance of timber to the building. As stated, however, the Takara community opted for a concrete slab flooring, stone wall infills and a thatched roof in accordance with traditional local design principles.

A pictorial record of the construction is presented in Figure 5 below:

Figure 5: Construction (Kaunitz 2012a)

The final construction report (Kaunitz 2012b), highlighted the following key issues from the construction component of the project:

- The project took eight months to construct, which is longer than that experienced for the reinforced concrete design (3-5 months generally). However, a substantial component of these delays resulted from procurement delays in the MoE. When these (and holiday periods) are removed, the construction period is 5 months, which is comparable with the reinforced concrete design However, future local milling of timber would add to this timeframe.
- A group of twelve local men predominantly undertook the majority of the construction work on the project. The Takara and surrounding communities also supplied the necessary sand, gravel, thatch and woven bamboo window hatches. Local timber species were used in construction.
- The cost of the hybrid was 5.45 million Vatu. This represents an approximate 50% saving of the reinforced concrete designed classroom building. If locally milled timber were be used, it is estimated the cost of the hybrid would decrease to approximately 30% of the reinforced concrete design meaning that school classroom production could theoretically be increased threefold – clearly a significant achievement in addressing demand for education in Vanuatu.
- Additional MoE support to the community is required, particularly in terms of procurement and on-site supervision. This could be achieved through outsourcing to the private sector and thus overcoming inherent capacity constraints.

The overall success of the community directed development approach is summarised in the following communiqué from the MoE supervisor of the project to the designer.

> *"Thank you very much everything.*
>
> *It's been a very big pleasure been working with you to put all our theories into PRACTICAL so now people of Takara , Efate, Shefa and all Vanuatu have witnessed and enjoyed so much the complete product.*
>
> *It has help me a lot too in my building capacity or carrier in hybrid construction and also shows me more creative ideas & techniques of mixtures of natural to artificial materials to develop schools and communities around all Vanuatu.*
>
> *This MODEL will grow so fast in the other island I can tell you, as now I am already having problems in working on the designs of the staff houses, classrooms, libraries and schools halls and all at one go, by using parts of our takara models for EPI ISLAND and EFATE ISLANDS following so many requests, and soon or later you will see some of them built."*

6 Conclusion

The increasing demand for primary level education in Vanuatu has placed pressure upon school infrastructure delivery mechanisms. The existing inside-out government controlled procurement paradigm of school infrastructure has proved incapable of catering for such demand.

This has resulted in the trialling of a community directed development (outside in) procurement paradigm comprising the design and construction of a “hybrid” double classroom building. The hybrid label is derived from a predominantly local based technological solution laced with some discreet deference to Western style engineering principles vis a viz earthquake and cyclone resistant principles.

The hybrid building was successfully piloted in the community of Takara on Efate island, Vanuatu in 2011/12. The project was constructed in comparable time to the mainstream reinforced concrete design, although at half the cost. Further economies could be expected as the process is refined through further implementation.

Subject to a detailed evaluation of user satisfaction which is yet to be undertaken, the hybrid pilot project provides a workable model of a community driven development approach that can be implemented on a broader scale to address current infrastructure supply constraints that potentially restrict access to primary education in Vanuatu.

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