New Conceptual Model for Improving Design Team Performance

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ABSTRACT: The success of many attempts to integrate sustainability into the design process over recent years has been limited. Despite growing awareness of the relevant issues and the development of appropriate technological solutions (often without significant financial penalty) barriers still exist. The design process can often result in poorly conceived sustainable design proposals and even when they are well-designed their value may not be fully appreciated by all the relevant actors. Their subsequent removal during the course of the project can be common practice - for example during 'value engineering'. Therefore, to address the shortfalls in sustainability integration, this paper aims to improve design team effectiveness and performance via the addition of a new conceptual model. The model integrates two important 'human' aspects (rather than technological) into the process. These involve, firstly, a means of capturing high-level group thinking ('vision') and, secondly, encouraging collaboration and evolution of collective thinking over the duration of the project. This model is also applicable to organisational high-level visioning and long term collaboration between its stakeholders which may be carried out in order to improve the performance of the organisation as a whole. Two well-establish design practices have begun testing the proposed mode and initial conclusions indicate that there may be considerable benefits to be gained from improving group dynamics and knowledge sharing through a formal collaborative frameworking mechanism.
Keywords: integrated, design tool, framework, vision, collaboration

INTRODUCTION

Sustainable design has developed into a well established idea. Its fundamental precept – the preservation of our environment for future generations of all species – has resonated with many and brought forth much interest, investigation and investment in its many diverse aspects. To provide designers and end-users with clear and simple reminders of the many facets of good practice aligned with the notion of sustainability, several models (and maxims, such as 'think global act local' or 'reduce reuse and recycle') have emerged. Given the amount of information associated with the design process and the limited time designers have to fulfil their roles, these models can be invaluable. Many mental design tools are simple lists of subjects that should be considered when engaged in sustainable design such as paying attention to building orientation, building envelopes etc. Examples include the well known is the 'One Planet Living' list [1] or more formal accreditation structures such as BREEAM [2] or LEED [3].

However, the nature of this evolving and emerging discipline which practitioners may endeavour to interweave into the existing design/construction processes is characterised by complexity and transience. Technical complexities are further compounded by the human elements associated with not only occupants but also the associated design teams.

As a result, there are now numerous examples of building projects that do not live up to design expectations [4]. For example a building that may be conceived to be a low energy consumer, may exhibit a disparity between the predicted and actual energy use (from on-site monitoring). Experience suggests that aspirational design intent can often be 'lost in translation'. Without adequate focus and group consensus, sustainable aspects can be diminished at many stages (for example, during 'value engineering', during handover to contractors or through poor occupant operation etc). Consequently, there is a strong need to address the gap between concept stage 'aspirations' and construction stage 'delivery' and between 'predicted performance' and 'actual performance'. In addition, there is also a need to address several pitfalls. For example, a poorly considered initial design brief or poorly conceived design proposals. These can often originate from not drawing fully on the expertise of those involved. An ability to tap more fully into this potential may help close gaps between the proposed level of design and the level of design required for a genuinely sustainable development.

Therefore, at this juncture in the evolution of the sustainable design process, a means of reframing of ideas, information and experience is proposed via simple (memorable) mental model to help improve the performance of design teams. In essence, a model which can assist design teams in the task of assigning value to sustainability aspects and recording/evolving ideas in a fully collaborative manner.

This paper also provides details of how the model is being trialled in two well-established engineering and architectural practices (both with involved in sustainability). The initial conclusions point to the significant benefits of having a comprehensive and easily memorable model to help keep priorities in mind throughout the design process and of maintaining a higher level 'shared vision' or collected understanding of the design in relation to a strong understanding of the wider context.

PROBLEM DEFINITION

In the present architectural arena lack of awareness of sustainability is no longer a key issue. Sustainability is now given significant column inches in websites and company brochures of the majority of designers and manufacturers and has made its home in the design briefs of the majority of major architectural projects.

The problem design teams now face is how to successfully integrate sustainability into their designs. It should be noted that, technology and industry know-how has also progressed to a level where this is no longer a major barrier for the creation of sustainable developments either. Despite this the level of sustainability of the majority of buildings and developments currently being built remains relatively low. Two of the main issues can come from design team interaction. These can be thought of as, firstly, a lack of a system to gauge the value/priority of sustainable design aspects and, secondly, a lack of systems to encourage unity within design teams:

A lack of systems to judge the value of and prioritise sustainability design aspects. In some design teams, the members working on environmental aspects of the design will attempt to find the balance between generating ideas (i.e. not missing out on opportunities) and being overloaded with options (which can dilute focus). This is not straight forward to achieve under common practice as the models used are typically lists of sustainable design aspects to consider (passive design measures, materials, etc) and generate large amounts of initial ideas. While these model are necessary (to ensure opportunities do not pass by) they are not sufficient for successful sustainable design integration as they do not account for a means to judge the value of the ideas and a means to prioritise / focus on the most important elements. Hierarchy can not be readily introduced to these general models as the position within a hierarchy will often be a function of the situation in hand i.e. dependent on the specific project and the local conditions (climate, topography, resources and culture aspects). Historically, design teams have judged value on various design aspects largely in financial terms and financial accounting systems are in place to measure and prioritise design elements. However, design elements related to sustainability have intrinsic value that includes but goes beyond simple financial accounting. The challenge in this case is how to introduce a simple system in design team practice that addresses the need to judge the value of and prioritise various sustainability design aspects.

A lack of systems to encourage unity within design teams. Engendering a sense of unify within a design team ensures good communication, commitment and productive design sessions. Good communication is crucial to ensure timely progress and to minimise abortive work, while a high level of commitment will increase the efforts individuals will want to make to achieve the aims of a project. However, introducing the idea of sustainability into a design can complicate team dynamics. For example, team members may find it difficult to know how committed other members of the team are to these aims and whether the focus is solely on capital gain for the client and for the team members. In the absence of knowing how committed the team and the client is to sustainability the default state may be to focus largely on revenue.

MODEL COMPONENTS

A simple system to introduce the ability of design teams to recognise and agree upon the intangible (non-financial) value of sustainable design aspects has been proposed. It is thought that this same system would also encourage team unity. The model is based on the premise that the human value of sustainability is not numerical, unlike financial value, and is based on fundamental ideas (beliefs based on available data) an individual has about the global and local context.

The system proposes to unify the fundamental ideas (from which 'value' arises) the team is adopting over the course of the project. These are the assertions or convictions the team holds as a whole in order to fulfil the aims of the project. The process of unifying ideas both requires and generates a more cohesive team.

The model can be thought of in terms of two dimensions. The first dimension is the rationale behind high-level design concepts and the second dimension adds the degree to which the group participates and interacts as a collective.

The first dimension is characterised by proposing, discussing, and formally recording a series of statements which belong to three progressive stages:

The Context The first stage is the agreement and documentation of the group perception of relevant contextual aspects. It is approached from two levels: current ideas (or beliefs) regarding the global context (e.g. climate change) and ideas on the local context (e.g. local energy or pollution issues).

The Challenge The second stage produces a statement relating the agreed contextual perceptions to the specific project being considered. It can be conceived as an opportunity to make the most of or a problem to be overcome. This is first presented as a general statement and then it is phrased into a specific question to be answered by the team.

The Concept The concept is the proposal for action. It is the proposed solution or the answer to the question posed. It is broken down into two parts. The first is a general statement on the overall principle behind the concept and the second part is the specific proposed action outcome(s) made by the team. Figure 1 shows a graphical representation of this first dimension of the model.

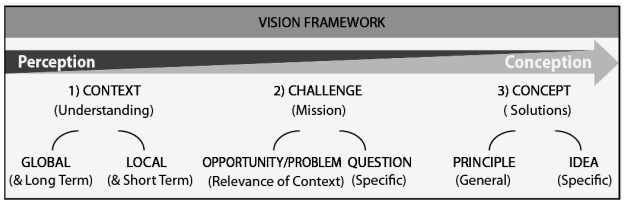

Figure 1: First dimension of the proposed model which shows the three main categories and six subcategories of the progression from 'perception' of a given situation to 'conception' of the team actions in order to address a problem or make the most of an opportunity.

This has the same essential structure adopted by the environmental performance management scheme ISO 14001: policy, objectives & action [5]. Or in simple language it is the: 'why', 'what' and 'how' of any given aspect of group thought and action. It allows the group to move through the progression from 'perception' of a given situation through to defining the challenge and finally to 'conception' of the collective solution.

It allows the capturing of useful information that is discussed in the earlier stages which could otherwise be lost over the whole course of the project. It also ensures that simple sustainability models are not used in isolation - that is to say, without an understanding of the specific challenge its elements relate to and the understanding of the context from which the challenge originates.

For example, a local renewable energy or CHP schemes may by proposed for a development (this could be an element on a list available from simple sustainability models). However, without the team agreement on a clear definition of the relevant opportunity/problem combined with clear group understanding of the context, these schemes are only integrated weakly into the concept of the proposed development. Thus they can readily downscaled or removed during the course of the project.

All statements generated using this proposed progression should be able to be evolved by the team members as the project progresses and as investigations provide new information.

The second dimension of the model ensures that the three stages of context, challenge and concept are not defined purely by one party but contributed to by all of the team. It also helps ensure that these element are not just defined at the start of the project but can be evolved as the team interacts.

The second dimension is represented by Figure 2 and encourages movement from a fragmented group to more unified group.

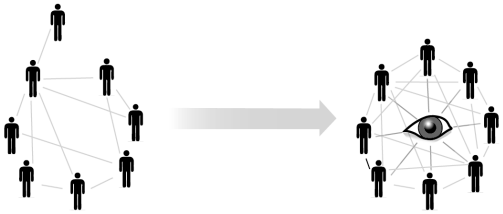

Figure 2: The second dimension on the proposed model which depicts the progression of a group through increased levels of cohesion and interaction in order to produce a collective vision on each of the elements of the first dimension

The consolidation that this model helps to encourage includes integrating the views of the client who often can be seen to act in a manner somewhat removed from the group. This can produce counter-productive side effects. For example, it is clear that any design aspects that will save or make the client money will generally be welcomed by the client; however, design aspects that relate to elements that are not just related to capital, such as sustainability, may be difficult to judge 'how far to take'. Poor communication between the team and the client can lead to abortive work (work on aspect of the design the client is not supporting). Good communication is essential in this industry as the design often progresses rapidly.

Management experts, such as Senge and Koffman, also encourage the move to more conscious awareness and reasoning behind group actions and state the benefits of groups functioning as a collective [6, 7].

PROPOSED MODEL

In order to facilitate its use, the proposed model has been referred to as the 'Collective Vision Framework'. The model combines the two dimensions described and a section consisting of numerous rows which is to be populated by the team. The first dimension is found on the x-axis running from stages 1-3 (perception to conception). The second dimension is found on the y-axis and represents the level of group interaction (proposal, discussion, investigation and evolution) for each of the three stages (Fig. 3).

It is proposed that the greater the area of the model the group is able to create, the greater the performance of the design team. For example, a low contribution and interaction from team members throughout the design process combined with a team which defines only the actions it proposed to take would produce a low area on the model and tend to produce a lower team effectiveness. Where as a high contribution and interaction from all team members throughout the design process (when appropriate) combined with a team which outline its perception of the context as well as the challenge and the action, would produce a large area on the model and tend towards greater team effectiveness.

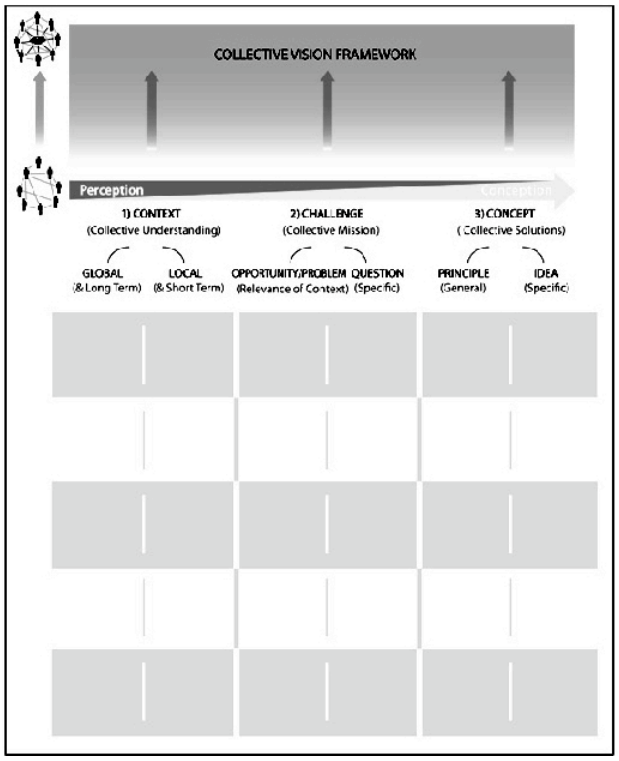

Figure 3: The proposed model for improving design team performance via the generation of collective vision for the context, challenge and concept.

PROPOSED METHODOLOGY

The method used to implement the model can be summarised as:

Step 1 – Nomination Nominate and announce the individual responsible for the upkeep of the model over the course of the design stages of the project (usually the individual responsible for environmental or the project leader)

Step 2 - Initial Proposal Generate an initial proposal based on the design brief which would consist of series of 'Collective Vision Lines' each comprising of the six perception and conception elements (this can be based on idea recycled and updated from previous models if available).

Step 3 – Discussion Discuss the list in the project 'kick-off' team meeting and record comments/proposed action for investigations.

Step 4 – On-line Updating Update initial proposals based on the initial comments and make the list available to team members (including the client) to comment on and evolve outside team meetings (in the manner of an on-line 'wiki').

Step 5 – Iteration and priorisation Iterate the procedure in subsequent team meeting until collective visions for each of the 6 elements for the whole list have a group consensus. During this process, the prioritisation of the emerging lines can be agreed upon.

The likely qualitative benefits of the using the model to define project challenges and action have been outlined in Figure 4.

Figure 4: Qualitative benefits of the proposed model in terms of team performance

Some projects and practices use the idea of KPI (Key Performance Indicators) which can be used to define the stance and targets a project team or company adopt. These can be issues which are not directly financial such as the impact of the company on various demographics and the environment, or the fostering of certain qualities such as leadership, learning, stakeholder engagement, staff well-being and elements related to client satisfaction. KPIs are linked to numerical and measurable targets. The practice of introducing measurable outcomes

is to be encouraged although the author proposes that this should not be forced into each line in this model as it is not always appropriate.

This model can be used to help generate KPIs or, as mentioned, items relating to company collective vision and strategy. In these cases the 'Principle' column under the 'Concept' element would outline the relevant KPI or 'Company Vision'. The model/document would then represent what can be thought of as the 'source code' for KPIs or strategic vision statements which can be referenced by any individual in the team / organisation. This provides an opportunity to tap into the collective wisdom (i.e. contributions from many perspectives) which ensures outputs are up to date and relevant.

MODEL CASE STUDIES

The model is under consideration in two commercial design practices. The first is a practice of around one hundred well-established environmental designer and service engineers. The second is a practice of around one hundred architects with an emerging sustainability consulting capacity.

The two examples given below have followed the five step methodology outlined in the previous section. However, in this case, the process was carried out in two stages. The first stage involves the creation of the initial proposal within the higher management team. This produced an initial proposal for the second stage which is an on-going company-wide iteration where the whole company is invited to participation in the development of the model/ document online. It should be noted that although the development period takes several months the number of man-hours per individual involved is very low and this can be seen as a background activity. The examples of the model output are given by 'Collective Vision Line' 1 & 2 below. The participation (in terms of simple awareness of the process and the content being developed) can be 100% as everyone is interested in the development of their organisation and the creation of a collective company vision.

Collective Vision Line 1

1) Context:

Global	*Local*
Shortage of experienced environmental engineers	Expanding company & shortage of skilled engineers is an issue New & current staff have varying levels of preferable technical & soft skills Staff have varying levels of clarity on their role & their future development

2) Challenge

Opportunity/Problem	*Question*
Problem: Difficulty finding a high standard of recruits Problem: Shortfall in development of skills in existing staff Opportunity: To attract new staff with 'high potential' Opportunity: To increase staff performance through active staff development	How can we have staff with a high capacity in the right skills for our company?

3) Concept

Theme (Principle)	*Solution (Specific)*
Adopt a company ethos which develops champions in the field: "We create heroes"	Create development plans that align three aspects of Company, Contextual & Staff development Allow active participation of the staff in planning Create awareness in staff of desired 'knowledge', 'skills',' behaviour' & 'outputs' Targeted CPD & company wide knowledge management system for developing 'explicit knowledge' Mentor/'buddy' system and project experience for developing 'tacit knowledge'

Collective Vision Line 2

1) Context:

Global	*Local*
Necessary shift from consumerist 'linear' processes to sustainable 'cycles' Clear leaders in sustainable /environmental design yet to emerge Accelerating change & exponential growth in: technology, knowledge communication & culture ideologies	Company has: Positioned itself at 'high-end' of market Developed considerable knowledge, skills & project portfolio (experience) in field of sustainability Good reputation (in limited circles) Inherent adaptability (e.g. no external share holders)

2) Challenge

Opportunity/Problem	*Question*
Problem: Low company profile in the industry & low impact on industry (relative to high potential) Opportunity: To increase company profile Opportunity: To increase staff sense of pride in their work & their company	How can we adopt a culture of leadership & become leaders in the field?

3) Concept

Theme (Principle)	*Solution (Specific)*
Adopt a company ethos of leadership: "We are leaders"	Encourage personal leadership Increase awareness key issues (consolidate understanding of key issues via wiki policies & participation in development of company plan) Encourage investment & solution development in new areas

There is anecdotal data which suggests the mere act of being able to see the strategic proposal for the organisation (transparency) and the invitation to be involved with contributing to its evolution has benefits related to staff morale. The system can not only generates a wealth of ideas, data and perspectives but

also a sense of unity and belonging which is thought to strongly relate employee motivation, and retention as well as performance of the organisation as a whole.

One of the challenges which has been seen when using the model is the difficulty in beginning to outline the ideas relating to context. For example, an individual may struggle to contribute if they do not have a good awareness of global or local issues or opportunities or if they have not taken time to consider the 'why' behind their actions. However this same individual can quickly be brought up to speed with the emerging information that the rest of the group builds and may be able to contribute in later stages. This difficulty in initiating the process highlights the need of the model – i.e. it highlights the lack of focus/awareness on the key issues and drivers.

Another challenge which also emerges is the degree of initial disagreement that arises between experienced individuals. Opinions on certain subjects (e.g. whether a certain technology should be invested in) partly come from certain ideas about the global and local contexts. It was found that once an understanding of the basis a disagreement is uncovered this often naturally led to its neutralisation. Again this challenge highlights the requirement use of the tool to flesh out the 'perception - conception' progression on the level proposed here with a degree of depth provided by a formal framework.

It was found that the more lines that are developed the more synergistic links in the strategy are made. This matrix allowed a means to tap into the important but intangible aspects of teams and organisations such as enthusiasm, sense of pride and unity, inspiration, trust, confidence and fulfilment.

CONCLUSION

This paper has proposed a model which aims to make improvements to the human aspects of sustainable design (in this case how design groups operate). It serves as a means to address the detrimental aspects of inconsistencies of understanding and vision within design teams and the lack of organisational frameworks for learning and knowledge sharing. The model aims to improve the performance of groups of individuals involved with issues that may not be primarily or directly financial – such as sustainability. It was found to achieve this by integrating two important elements into the way groups of individuals work. These two elements (or dimensions) are:

1) An understanding of the progression from 'perception' of a given situation to 'conception' of the team actions or guiding principles.

2) An opportunity to increased interaction contribution from team members (i.e. increased unity).

The model allows a consensus not only to the agreed upon each line but also the relative priority or importance of each line. This introduction of hierarchy allows individuals to keep in mind the most important aspects.

It can allow sustainability to be seen as an integral part of a project (if appropriate) and help prevent the removal of certain aspects in the name of cost savings. Furthermore, it is thought that having a more consolidated design team can produce significant cost saving by, for example, minimising abortive work and by reaping the benefits of increased team enthusiasm and energy.

Challenges to the use of the tool were found. For example, the difficulty for some to contribute (e.g. those with a lack of context awareness) and the initial disagreements which precipitated in the initial period. With a certain degree of tenacity it was found that these issues (which the model aims to mitigate) can be resolved. This process has been seen to become easier as experience increases. Ideas established, documented and developed on the global context may be relevant/transferable to other project team and other groups using the model. The results suggest that creating an atmosphere of genuine positivity about a given project or a company also boosts motivation and innovation. The model can be thought of as a means of introducing ideas consistent with storytelling as a means of aligning design parties. This could extend to include wider circles – e.g. to the supply chain and occupants (and beyond).

Future work on in this area involves continuing existing use, increasing competence with the framework and evolving the process.

ACKNOWLEDEMENTS. The author would like to extend sincere thanks to Aurore Julien at Llewelyn Davies Yeang, Architects, London, UK and Thomas Russell / Nadir Abdessemed at BDSP Partnership Ltd, Consulting Engineer, London, UK.

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