

DYNAMIC STATES OF PROJECT PURPOSE: TRANSITIONS FROM CUSTOMER NEEDS TO PROJECT REQUIREMENTS

IMPLICATIONS FOR ADAPTIVE MANAGEMENT

Michael Whelton¹ & Glenn Ballard²

ABSTRACT

The primary goal of the project definition process is to define the customer's project purpose. Without properly understanding what customers are trying to achieve, designs are not likely to meet those needs. Purpose is a term to signify intent and is the primary driver in value generation. Developing project purposes is a dynamic process and changes to purpose occur throughout the course of project definition. Customer and stakeholder needs transition through various states of definition and various levels of commitment by stakeholders. We propose that purpose emerges from collaborative group interaction i.e. it is considered to be an emergent product of the group creation process. This paper is particularly centered on project managers and the way they dynamically manage changing purposes in the early phase of project definition. The research advocates the use of an adaptive management framework to manage such dynamic complexity. We seek to explore adaptive management techniques that steer the dynamic nature of purpose creation and change. Facilitation for group learning is a prime attribute of management capability in this phase. The conceptual framework is comprised of facilitative management actions supporting the transition of purpose from need to requirement. Based on this framework, a set of linguistic constructs are developed to support the management of the project definition conversation.

KEYWORDS

Adaptive management, customer needs, emergence, project definition, purpose, requirements, value generation.

¹ Ph.D. Candidate, Engineering & Project Management Program, Department of Civil & Environmental Engineering, University of California, Berkeley, USA, mwhelton@uclink4.berkeley.edu

² Associate Adjunct Professor, Engineering & Project Management Program, Department of Civil & Environmental Engineering, University of California, Berkeley, USA, ballard@ce.berkeley.edu

INTRODUCTION

Ballard and Zabelle (2000) define project definition as “the first phase in project delivery consisting of three modules: determining purposes (stakeholder needs and values), translating those purposes into criteria for both product and process design, and generating design concepts against which requirements and criteria can be tested and developed”. This research is concerned with projects where organizations perceive the need for a physical facility to support their strategic and operational goals; i.e., capital facilities projects. In this context, project definition refers to front end planning and design activity for facility projects requiring capital investment. Such activity is also known to the industry as strategic planning, client briefing (the term commonly used in the UK) and project programming as traditionally practiced by architects and planners.

Project definition is now a multi-disciplinary and knowledge-intensive process requiring the co-production efforts of both the customer and construction industry specialists. Based on exploratory research the authors have proposed a collaborative framework to manage project definition groups (See Whelton et al. 2002). The authors have advanced situational case studies (Whelton and Ballard, 2002) to argue that project definition performance is impacted by a complex network of decision action by stakeholders. We concur with problem-solving researchers such as Rosenhead and Mingers who aptly summarize the state of project based environments as follows:

“Making and taking decisions, solving problems, designing and re-designing systems nowadays all have to take place in conditions of unprecedented complexity and uncertainty” (Rosenhead & Mingers, 2001).

In this research context, we perceive the project definition process to occur within a social system constructed of stakeholders that employ complex strategies, policies and routines. This social system is perceived to be complex in detail and dynamically complex in behavior. This research seeks to understand complexity and dynamic change of project purpose. Currently there is a lack of study into the dynamics of “purpose” development and this serves as the primary motivation for this research. Within the context of value generation, the term “purpose” is used to indicate needs, values, preferences and requirements. James March states that the language terminology that describes purpose can include: “values”, “needs”, “wants”, “goods”, “tastes”, “preferences”, “utility”, “objectives”, “goals”, “aspirations”, and “drives”. Purposes change as project variables are further defined and their relationships are better understood. If purpose is in a dynamic state, in a changing mix of advocacy and commitment, it is necessary to understand the transitional states of purpose. Purpose may reveal itself through the interconnected relationships of needs, stakeholder values and the project constraints.

We focus our efforts on the role of management and its capacity to adapt process conditions to support emerging purpose. Our research approach focuses on the project definition conversation or dialogue, which we posit as the primary medium for value generation and collaborative action. Organization of this complex system is perceived to occur through networks of communications, conversations and dialogues among system agents (stakeholders). Therefore the research is directed towards understanding the

management of these dynamic conversations among client representatives, project management and Architecture-Engineering-Construction (AEC) specialists. Managing the group process requires due consideration for the various specialist and non-specialist workplace languages used by stakeholders.

The paper briefly reviews the background literature on value generation frameworks and we identify the primary stages of value generation. The dynamic complexity of developing project purpose is described. Based on such complexity, the proposition that purpose is an emergent product of the collaborative group process is discussed. The paper then identifies the role of management with respect to managing purpose. A conceptual framework is developed. This framework emphasizes facilitative action by management, which can enable the process to be adapted as purposes emerge. The conceptual framework consists of a purpose oriented “needs-requirements” transition model. To support the transition of purpose through these states, a set of facilitation functions are specified. Based on this adaptive framework, a set of linguistic constructs that are embedded in project definition conversations are described. These linguistic actions serve as a potential means to further understand and effectively manage group conversations.

BRIEF REVIEW OF VALUE GENERATION

A primary objective of projects is to generate value. In Koskela’s Transformation-Flow-Value theory of production, value generation is viewed as a process where value for the customer is created through fulfillment of his requirements. Womack and Jones (1996) state that value can only be defined by the ultimate customer and it (value) is only meaningful when expressed in terms of a product or service, or both. The supplier/provider role is partly defined in terms of delivery of value to customers. However producers engage in production in order to accomplish their own purposes/create value for themselves. Further, producers’ perceptions of customer value tend to be influenced by their professional and personal backgrounds. Stakeholder values and their value judgments are the dominant influence on how purpose transitions from needs to requirements. Value systems influence the way customer needs are construed and represented. Hence, value generation is not a simple process and requires subtle management action in order to be successful.

The opportunity to create collaborative customer and stakeholder value has been well recognized in the practice of value management. Barton (2000) views value management as *a structured, facilitated process in which decision-makers, stakeholders, technical specialists and others work collaboratively to bring about value-based outcomes in systems, processes, products and services*”. The role and responsibility to generate project value is a collective organizational one. Yet, given the extreme fragmentation of the construction industry, the potential for project definition to create value is often undermined by breakdowns and conflicts in the collaborative process. Frequently value management exists as a separate service within the industry. It is often used as a means for critiquing a previously produced design, as opposed to being applied in the project definition phase. An exception is the practice of value management in product development processes; for example, in support of

target costing. This practice seems to be applicable to capital facilities projects and has reportedly been applied on a number of design-build projects³.

Murman, et al. (2002) propose a framework for value creation consisting of three phases: value identification, value proposition and value delivery. The framework is based on the premise that value should be delivered only after identifying value and constructing robust value propositions. The first phase, value identification, involves identifying stakeholders and their value needs, also understood by negotiation researchers as ‘interests’. Once initial needs and values are identified the process moves to the proposition phase where the needs of stakeholders come together. The propositional phase creates collective purpose for the project. It identifies value dependencies and differences between the stakeholders. Latent needs and hidden stakeholders may also be identified. This phase ultimately seeks to create stakeholder alignment and collective commitment.

The necessity of complete definition of value prior to delivery is contested both within the capital facilities sector and from other types of project-based production systems such as software engineering. For example, the Scrum methodology advocates a relatively rapid alternation between developing software functionalities and developing customer needs through use of that software. While we agree that problems should be stated in solution neutral terms to the extent possible (as proposed by Kamara et al. 2000), full testing of purpose and criteria may be only be validated through concept generation and reflection. Consistent with the complex nature of the design task, designers tend to be solution focused. While this may result in premature acceptance of a problem definition, this tendency can also be channeled into sharpening problem definition through exploration of possible solutions.

DYNAMIC COMPLEXITY OF PROJECT PURPOSE

In the domain of capital facilities design and construction, understanding the strategic and operational needs of the customer organization creates a basis for understanding project purpose. Smith (2000) argues that “when the strategic analysis of needs has been rigorously and conscientiously pursued then it should result in a clearer view of the goals of the organization, a better definition of its real needs and the strategic decision should recommend the best means to achieve those corporate goals”. The uncertainty associated with needs may be high, especially for large, multi-faceted, client organizations. Needs change over time in uncertain environments. Needs analysts may find it necessary to look at varying timescales so to identify the implications of needs and their dynamic changes (Nutt, 1993).

Altschuld and Witkin (2000) define a need as “a measurable discrepancy between the current and desired status for an entity”. Table 1 identifies the general levels of need that exist in organizations. With a specific organization in mind e.g. a healthcare service or an educational service, level 1 addresses the needs of the organization’s primary customers. Level 2 needs pertain to the organization’s groups and individuals tasked with providing services to the customers in Level 1. Level 3 needs are those surrounding resources that support levels 1 & 2. These needs may be facilities and support systems. Level 3 is the needs level within which construction professionals normally operate. Construction professionals may only see their role as supporting level 3 needs, but levels 1 and 2 are the primary

³ Private communication to the authors from member companies of the Lean Construction Institute.

organizational needs that must be satisfied. A holistic approach to needs is advocated to incorporate all levels of needs. Loss of focus on Levels 1 and 2 can result in poor performance of the project definition process. Herrmann et al. (2000) equally recognize the need for producers to broaden their focus and bridge the gap between internal process quality and external customer needs and satisfaction (traditionally the focus of marketers).

The interdependency exists not only across levels of need, but also over time. For example, a healthcare organization⁴ has many unknowns regarding future needs. Healthcare administrators are tasked with fulfilling short term needs; i.e., what is needed now, yet in the long term, healthcare services are expected to change in terms of both the customer (patient) demographics and the technological service innovations that support medical care. Hospital facilities typically have long development cycles from inception to delivery.

Table 1: Dynamic Needs (Adapted from Altschuld and Witkin, 2000)

Focus on Institutional Environment <i>E.g. A Healthcare Service or an Educational Service</i>	Level of Need	Target Groups	Change over time		
			Past	Present	Future
<i>Healthcare patients or Students</i>	1 – Primary	Direct Recipients of services or products delivered by the Customer	User Profiles slow to change	Changing customer demographics	Unknown customer profiles
<i>Professionals and administrators</i>	2 – Secondary	Individuals or groups that deliver services or products to level 1	Bureaucratic Hierarchical structures	Obsolete work methods	Changing work practices
<i>Service and product systems e.g. a building facility</i>	3 – Tertiary	Resources and inputs into solutions to support levels 1 & 2	Existing Legacy systems beyond intended life cycle	Obsolete workplace systems	Changes in Resources and Technology

Requirements originate with needs. Eodice's (2000) PhD thesis on a theory of requirements definition in engineering design identifies notable relationships with requirements and needs:

"A need is an identified desire for the product which has been formally expressed and accepted by the group... An advocate is an individual or group that assumes responsibility for taking whatever action is necessary to implement a specific need... A requirement may be defined as any pairing of a specific need with a specific advocate, or a series of advocates, that leads to implementation of the need".

Eodice claims that the confusion with need and requirement can be avoided if one adopts the view that when a need becomes constituted into the final product design (or specification), only then does it become a requirement. This notion resonates with Hook and Farry's requirement's process of V&V: Validation of need (Is the need necessary?) and Verification of implementation (Can we implement the need through a viable solution?). When the need is

⁴ Comments from an interview with a program manager managing a large hospital replacement project.

validated and verified with evidence of being implemented within a solution, only then does the requirement stand.

MANAGING THE EMERGENCE OF PURPOSE

Complexity often results in features called emergent properties, which are properties of the system, though not of its parts (Axelrod et al. 1999). We associate emergence with dynamic systems whose behavior arises from the interaction of its parts, and cannot be predicted from knowledge about the parts in isolation (Corning, 2002). London and Ostwald (1996) identifies the behavior of group processes as being inherently difficult to predict. A key issue with understanding purpose is the synergy that a collaborative process creates. According to Corning “*synergy refers to the cooperative effects that are produced by two or more particles, elements, parts or organisms – effects that are otherwise not attainable*”.

Within the context of project definition, it is worthwhile identifying the concept of emergent purposes based on the synergistic interaction of the customer, management, specialists and other relevant stakeholders. Figure 1 is a schematic illustrating two primary spaces that facilitate stakeholder conversations and dialogue. These spaces facilitate the development of needs and these needs transform into project requirements through some facilitated process. The space facilitating “needs” is deemed highly uncertain and almost chaotic. In the project requirements space, needs are tested in the form of solution concepts. As development time progresses, this space is perceived to reach a stable form through solution convergence and stakeholder consensus. Purpose is seen to emerge once stakeholders progress to consensus. If we continue with the idea that a need transitions into a requirement, then we must better understand the transition process and identify means to effectively manage it.

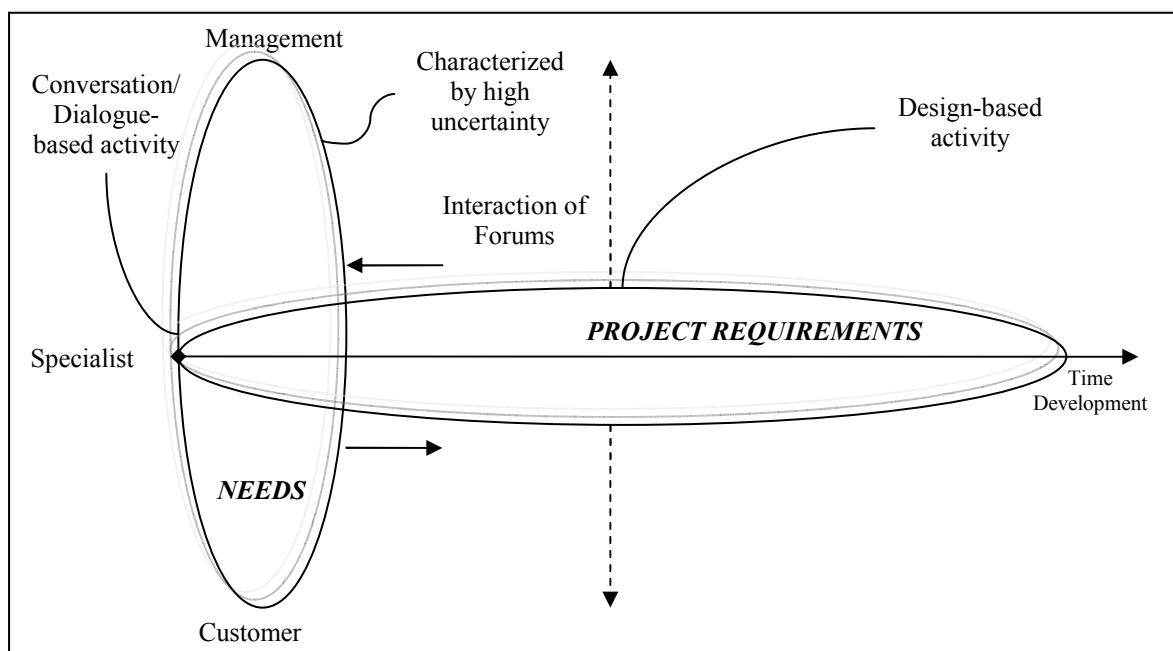


Figure 1: Schematic of Interaction Spaces: Needs Based Dialogues versus Design Based Requirements Development

DIRECTIVE VERSUS ADAPTIVE MANAGEMENT

Streatfield (2001) raises the issue of control and who or what is in control in a complex organization. In our context how is the project definition process controlled if we deem the environment to be dynamically complex and what is the role of management? Stacey (1999) recognizes the limitations of mechanistic style approaches to management. Figure 2 illustrates management's role as defined by the levels of complexity in the environment and organization. Directive management techniques are suitable for systems that display low levels of complexity and change. Within the context of project definition activity, purposes are more difficult to establish in environments of high complexity and change. A more adaptive style of management is therefore necessary. Adaptive management of project purpose is a dynamic learning process. Management's capacity to adapt is based on its ability to recognize and understand the dynamic character of the group learning process and the emerging purposes.

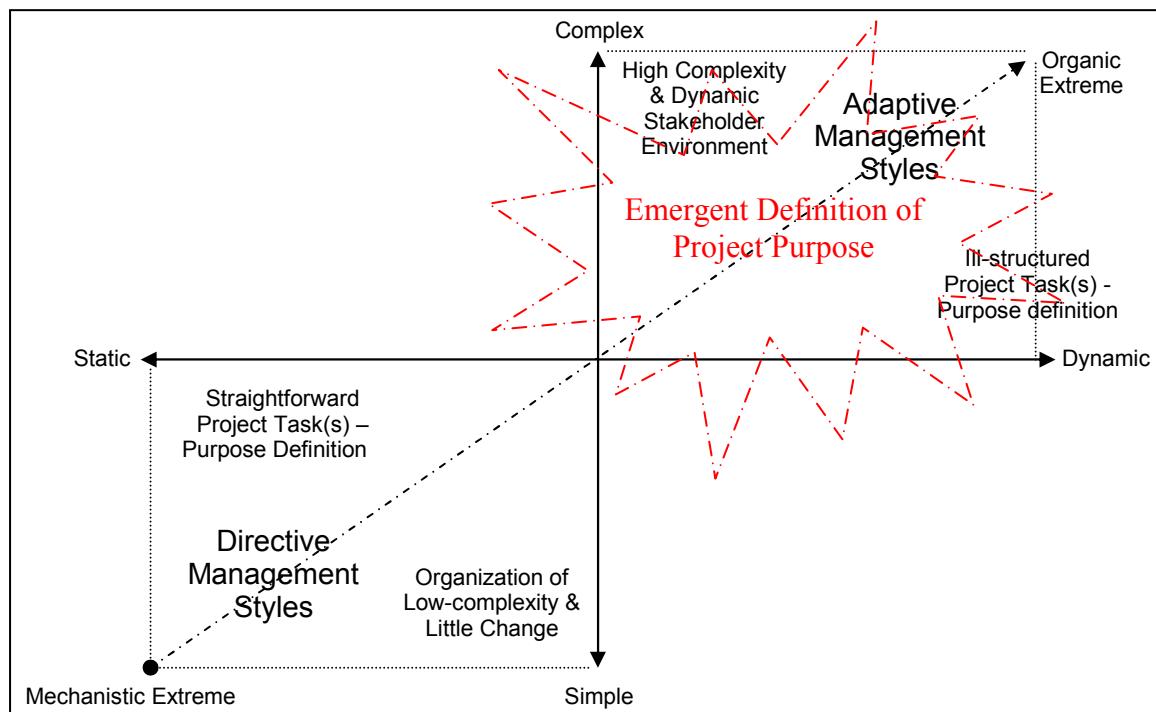


Figure 2: Project Management Styles and Complexity (Adapted from Stacey, 1999)

The notion of adaptation is important for management to understand when operating in highly complex project environments. Ruitenbeek & Cartier (2001) view adaptive as referring to the means by which groups learn from actions in one period, so that they may modify their actions in future periods. The essence of adaptive management is that managers can learn as actions unfold and as new issues emerge (Graham & Kruger, 2002). Management may find itself continually iterating and redefining the basic premises of

purpose, based on constant feedback and incremental learning cycles. Eden et al. (1998) raise a concept called emergent strategy. Emergent strategizing is a process, a stream of actions that form a pattern. Organizations may or may not be aware of the patterns of decision making, thinking and action. Implicit goals or purpose develop through organizational action. This action may or may not be strategically planned.

AN OPERATIONAL FRAMEWORK FOR ADAPTIVE MANAGEMENT

The role of management in project definition is to facilitate learning about purpose. The extended process results in understanding the governing problem variables and altering actions to determine how the original project goals and design criteria were set and established. Frequently learning may focus on changing actions without a focus on the governing variables. Governing variables may include the initial problem formulations represented in client purpose, team assumptions, stakeholder needs and project constraints. Learning is vital in project definition as the governing variables are instrumental in developing project purpose. Management may be required to identify conditions where the governing variables need to be further evaluated, in order to avoid premature requirements definition. Figures 3 illustrates the cycles of purpose development. The framework illustrates a “need-requirement” transition timeline which is the central level of analysis. Dividing the timeline is a set of facilitation points that steer the conversation. The facilitative functions may steer the discourse in a direction that expands or narrows the range of needs analysis as necessary. Management may act as a linkage function to couple or de-couple problem frames that stakeholders are using.

MANAGEMENT CONTROL AS FACILITATION

As illustrated in Figure 3, generic management actions facilitate the development of client and specialist knowledge. The facilitation actions allow access to the customer organization and their knowledge bases. A set of operational methods and tools support each facilitative action. The supporting actions of the customer center on establishing: needs, values, preferences, choice and commitment. The ability of management to facilitate and their motivations for choosing a specific facilitative action at a point in the process warrants further understanding. If we consider that multiple needs and values exist when defining the purposes of the project, control may be understood as effective facilitation. By facilitation we mean promoting interaction, participation, relating and dialogues. Facilitation has come to mean many things to many project participants. There exists a plethora of facilitation styles, methods and tools, but for now, the authors are more concerned with defining facilitation not in terms of techniques but rather in terms of its objective; namely, a participative and collaborative process.

We adopt Melgrati & Damiani's (2002) list of adaptive management actions. The central actions are: initiating, defining, qualifying and closing. “Initiating” in our context refers to some sort of search function; e.g., initiating a conversation about needs. “Defining” refers to some level of analysis and synthesis of the needs. “Qualifying” is an evaluation of the need in the form of requirements modeling. This action seeks to understand the constraints associated with implementing the need. Finally “Closing” is a management action that develops commitment and choice for the project purposes that are developed.

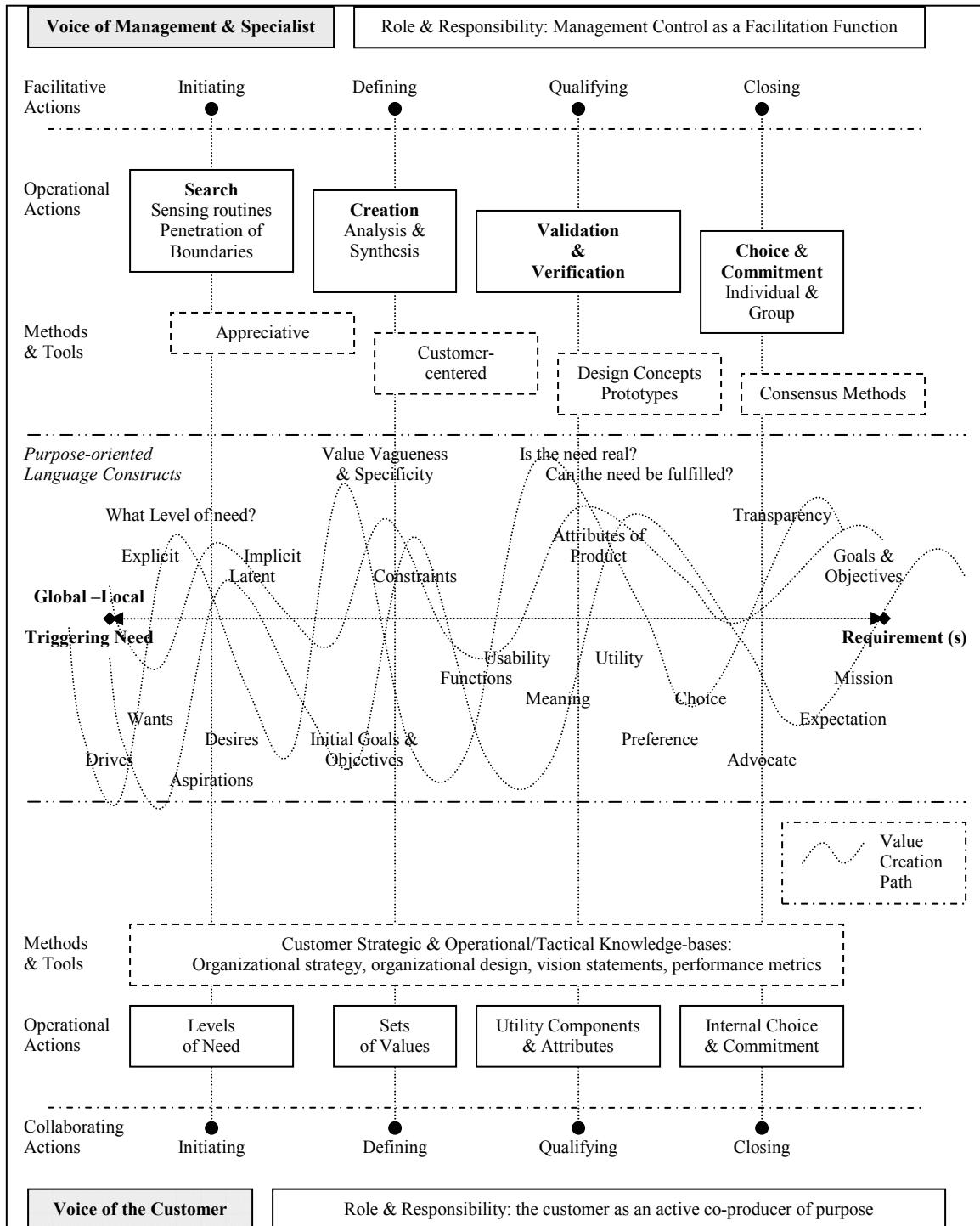


Figure 3: Conceptual Purpose Modeling Cycle: From Need to Requirement.

Purpose is generated in the ongoing dialogue between stakeholders. As client entities and diverse industry specialists collaborate to co-produce individual and collective purposes, breakdowns of many types are to be expected given individual worldviews. London (1997) uncovers a complex network of issues within and between stakeholder groups. Management's perception of conflict between stakeholders regarding purpose is critical in order to be able to re-align purposes through collaborative dialogue. Fonseca (2002) sees the quality of stakeholder participation in conversations as instrumental in creating value. Scharmer (2001) identifies that reflective and generative dialogue are minimum conditions for knowledge emergence and in our case for effective value identification and value propositioning. Quite often collaborative conditions are not attainable due to the complexity of the project definition environment. It may not be easy for management to create conditions for dialogue. Depending on the collaborative relations, levels of value generating dialogue may or may not be achievable.

MAPPING EMERGENT PURPOSE AND ADAPTIVE MANAGEMENT PATTERNS

As Figure 3 illustrates, the language constructs emerge over various states of purpose development. The variables located on the needs-requirements space show their evolution. We realize that iterative cycles of development occur. The aim of this diagram is to illustrate the conversation spaces with respect to the need requirement axis and the management/specialist and customer roles. We acknowledge that linear progression from need to requirement is improbable. Moreover, the dynamics of group discourse will reveal non-linear patterns of development. Emergence of purpose will depend on the makeup of the group and the adapted management style to suit the organization's structure and style of performing work.

UNSTITCHING THE GROUP CONVERSATION

We assume project definition activity is a social process. In its simplest form, project definition is developed through networks of conversations and dialogues performed by strategic and operational stakeholders. Management facilitates the development of customer and specialist knowledge. Based on their worldviews, stakeholders act within multiple paradigms and perspectives, which are in turn supported by strategies, methods and tools specific to that stakeholder background, knowledge and experience.

The language of project purpose is ambiguous and therefore understanding that language is a pre-requisite to developing a dynamic model of purpose creation. The terms: needs identification, value statements and requirements processing are often used synonymously. Table 2 shows the main language constructs observed in project definition conversations. Central to the role of management is the capacity to establish a working language for managing multiple voices in the project definition conversation.

The future research will experiment with how management adapts the group process so to identify value and develop value propositions. A case study organization has been selected to further test the propositions regarding the emergence of purpose and management's adaptation capacity. The experiments propose protocol studies to map management patterns of adaptation in relation to the emergent purposes and contextual conditions.

Table 2: Language constructs synonymous with managing project purpose

Purpose -Variables	Generic Definition
Need	A pressing lack of something essential
Latent Need	(Need) present, though not now visible, obvious, or active
Want	To have or feel need; something wanted: need or desire (a perceived need)
Aspiration	A strong desire to achieve something; an object of such desire
Desire	To express a wish for : request
Taste	Individual preference: inclination, critical judgment, or appreciation
Value	A relative worth, utility, or importance
Expectation	the act or state of expecting : ANTICIPATION; basis for expecting : ASSURANCE “they have every expectation of success”
Drive	An urgent, basic, or instinctual need
Intent	Having the mind, attention, or will concentrated on some end or purpose
Purpose	Something set up as an object or an end to be attained: INTENTION
Issue	A matter that is in dispute between two or more parties
Perspective	A mental view or prospect; The interrelation in which a subject or its parts are mentally viewed
Position	A firmly held point of view or way of regarding something
Preference	The act of preferring: the state of being preferred: the power or opportunity of choosing
Satisfaction	The fulfillment of a need or want; the quality or state of being satisfied
Advocacy	the act or process of advocating or supporting a cause or proposal
Function	the action for which a person or thing is specially fitted or used or for which a thing exists : PURPOSE
Goal	The end toward which effort is directed: AIM
Objective	Something toward which effort is directed: an aim, goal, or end of action
Priority	A preferential rating
Value Judgment	A judgment assigning a value (as good or bad) to something
Utility	Fitness for some purpose or worth to some end
Meaning	The thing one intends to convey - significant quality
Inquiry	The act or an instance of seeking truth, information, or knowledge about something – and yielding results, benefits, or profit
Definition	To determine or identify the essential qualities or meaning of
Criteria	A project criteria is a standard upon which a design solution adheres to
Demand	An act of demanding or asking especially with authority
Constraint	A constraining condition, agency, or force
Concept	A “design concept” is a solution to a perceived problem or need
Reflection	To express a thought or opinion resulting from reflection
Usability	Capability of use. A design is judged on its fitness for use or in other words: “ the extent to which it realizes the purpose of those for whom the artifact is being produced”
Validation	Purpose requires validation: Is it truly what is sought?
Verification	The act or process of verifying: can purpose be realized in a design solution and the project constraints?

CONCLUSIONS

Prior to delivery of value, value is first identified and collectively created. Project purpose is instrumental in identifying customer and stakeholder value. Purpose is seen as a fuzzy variable transitioning through many states of definition and levels of commitment or advocacy. The inter-relationships of stakeholder needs, values and constraints are what define the requirements through which purpose is fulfilled. Purpose emerges through multiple and complex group dialogues. Through our conceptual framework we propose to further develop and test the proposition that purpose is an emergent product of the project definition group process. The role of management in project definition is to facilitate learning about purpose. The capacity of a managerial process to support the emergence of purpose requires further

research, in order to understand various means of effectively managing the group conversation.

REFERENCES

- Altschuld, J. and Witkin, B. (2000). *From Needs Assessment to Action: Transforming Needs into Solution Strategies*. Sage Publications Ltd., Thousand Oaks, CA.
- Axelrod, R. and Cohen, M., D. (1999). *Harnessing Complexity, Organizational Implications of a Scientific Frontier*. The Free Press, New York.
- Ballard, G. and Zabelle, T. (2000). "Project Definition". *White Paper #9*, Lean Construction Institute, USA. <http://www.leanconstruction.org>
- Barton, R. (2000). "Soft Value Management Methodology for Use in Project Initiation – a Learning Journey". *Journal of Construction Research* (2000) 1, 109-122. Hong Kong.
- Corning, P. (2002). "The Re-emergence of "Emergence": A Venerable Concept in Search of a Theory". *Complexity*. 7, 8, 18-30, Wiley Interscience.
- Eden, C. and Ackermann, F. (1998). *Making Strategy, the Journey of Strategic Management*. Sage Publications, London.
- Edice M. (2000). *A Theory of Requirements Definition in Engineering Design*. PhD Thesis, Department of Mechanical Engineering, Stanford University.
- Fonseca, J. (2002). *Complexity and Innovation in Organizations*. Routledge, London.
- Graham A. and Kruger, L. (2002). *Research in Adaptive Management: Working Relations and the Research Process*. United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, Research Paper. PNW-RP-538
- Herrmann, A., Huber, F. and Braunstein, C. (2000). "Market-driven product and service design: Bridging the gap between customer needs, quality management, and customer satisfaction". *International Journal of Production Economics*. 66 (2000) 77-96. Elsevier. UK.
- Hooks, I. F. and Farry, A. K. (2001). *Customer-Centered Products: Creating Successful Product through Smart Requirements Management*. AMACON, New York, USA.
- Kamara, J. and Anumba, C. (2001). "A Critical Appraisal of the Briefing Process in Construction". *Journal of Construction Research*. Vol. 1, No. 2, 13-24, Hong Kong.
- Koskela, L. (2000). *An exploration towards a production theory and its application to Construction.. VTT Publications*; 408, 296 p. Espoo, VTT Building Technology
- Liu, A. and Leung, M. (2002). "Developing a soft value management model". *International Journal of Project Management*. 20 (2002) 341-349, Elsevier.
- London, K. (1997). *The development of a post occupancy evaluation model based upon a systems approach*. Unpublished Masters Thesis, University of Newcastle, Australia.
- London, K. and Ostwald, M. J. (1996). "Complexity in natural systems: the implications for research into the operations of design teams and groups with the building industry". *30th Annual ANZASCA conference*. Hong Kong.
- March, J. G. (1983). *The Technology of Foolishness, Ambiguity and Choice in Organizations*, by March J. G. and Olsen, J. P., Universitetsforlaget, Norway.
- Melgrati, A. and Damiani, M. (2002). "Rethinking the Project Management Framework: New Epistemology, New Insights". *Proceedings of PMI Research Conference* (2002), Seattle.

- Murman, E. and Allen, T. (2002). *Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative*. Palgrave, New York.
- Nishiguchi, T. (2001). "Coevolution of Interorganizational Relations". In *Knowledge Emergence: Social, Technical and Evolutionary Dimensions of Knowledge Creation*. Eds. Nonaka, I., Nishiguchi, T., Oxford University Press, New York.
- Nutt., B. (1993). "The strategic brief". *Facilities*. Sept. 1993, 11(9):28-32.
- Rosenhead J. and Mingers (2001). *Rational Analysis for a problematic World Revisited: Problem Structuring Methods for Complexity, Uncertainty and Conflict*. 2nd Edition, John Wiley & Sons Ltd, New York.
- Ruitenbeek, J. and Cartier, C. (2001). "The Invisible Wand: Adaptive Co-Management as an Emergent Strategy". in *Complex Bio-Economic Systems*. Center for International Forestry Research, Occasional Paper No. 34, Indonesia.
- Scharmer (2000). "Self-transcending Knowledge: Organizing around Emerging Realities". In *Managing industrial knowledge: creation, transfer and utilization*, Nonaka I. and Teece D. (eds.), SAGE Publications, London, 68-90.
- Smith, J. and Jackson, N. (2000). "Strategic needs analysis: its role in brief development". *Facilities*, 18(13/14).
- Stacey, R. (1999). *Strategic Management and Organizational Dynamics: The Challenge of Complexity*. 3rd Edition, Prentice Hall, London.
- Streatfield, P. (2001). *The Paradox of Control in Organizations*. Routledge, London.
- Whelton, M., Ballard, G., and Tommelein I.D. (2002). "A Knowledge Management Framework for Project Definition", *Electronic Journal of Information Technology in Construction (ITcon), special edition on Knowledge Management*. Vol. 7, No. 13, 2002.
- Whelton, M., and Ballard, G. (2002). "Wicked Problems in Project Definition". *Proceedings of the International Group for Lean Construction 10th Annual Conference*, Brazil, August 2002.
- Womack, J. and Jones, D. (1996). *Lean Thinking: Banish Waste and Create Wealth in your Corporation*. Simon & Schuster, New York.