6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015

Multi-ontology sense making – Decision making of project core team

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Abstract

In order to understand core team's management task this paper studies the landscape of the decision making of the construction project core team. This paper uses multi-ontology sense making framework developed by Snowden. The four described situation illustrate the use of this framework. Firstly, a project core team create a project plan –timetable and cost estimate, that is supposed to be followed (rules and order) when making investment decision. Secondly, a project core team uses the plan but since the plan cannot be followed due to an unexpected situation the team changes the plan by calculating an optimal solution. In other words the team uses heuristic thinking when they change the rule (heuristics and order). Thirdly, the design group guides the design process by rules to get information for designing new facilities (rules and un-order). Fourthly, there are situations when the stakeholders have different kind of opinions in crisis and team cannot follow the preset orderly way of working (heuristics and un-order).

Keywords: Sense making; Decision making; Ontology; Project; Core team; Construction industry

1. Introduction

Core team in this paper is a cross-organizational team that functions as self-directed team assigned to manage a construction project. However, the self-direction has limits like budget, timetable and scope that are preset by the project owners. The core team is composed of multi-disciplinary individuals. Each member offers an alternative

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perspective to the problem and potential solution to the task. In construction industry, the creative solutions of the core team seldom however lead to innovations that are possible to be utilized in next projects as such. So the core team participants learn and utilize the knowledge in their next projects. The advantage of core team promotes solutions through a creative collaboration process. Decision making within a core team may rest on on consensus, but often is directed by a team leader.

Ontology is the branch of metaphysics that concerns itself with the nature of things. In this article ontology is used to identify different types of system defined by the relationship between cause and effect. Sense making is a framework that seeks to explain how people analyze unknown in order to act based on the analysis.

The scope of this research is construction project management. Construction project starts with planning, design, and financing and continues until the building is ready for use. Decision making and responsibilities are divided according to the solutions and principles where cost, competitiveness, expertise and availability of desired resources are examples of factors affecting the forming of a project organization [1]. The nature of a project world is orderly way of working and the epistemology is rule based. However, in project it is understood that dialogue and sense making enable the core team to openly face its environment as seen from the different expertise perspectives and this enables the project to reach better results.

In order to study the landscape of the decision making of construction project core teams this paper first describes the characteristics of construction project, secondly introduces the multi ontology sense making framework [2] and thirdly uses case studies to illustrate how the core team makes currently decisions, the discussion part opens the difficulty of selecting the way of decision making and the final statements are written in conclusions. The research method of this paper is case study.

2. Characteristics of construction project

Both the internal and external environments of construction projects are dynamic and fairly unstable. Changes during a project's development may have significant and often unpredictable effects on project's organization and management. Hence, project managers need to respond correctly to change and understand how it can influence the performance of the project.

Typically, project organizations involve team members from different organizations that participate the project at different points in time to form a temporary multi-organization [3], or a short-lived changing grouping [4]. Relationships between team members are governed formally by the contract(s) but are supplemented and moderated by informal understandings and protocol that have evolved over time; very often to cope with unforeseen difficulties. The latter characterize construction [5] and numerous studies [6, 7] have recognized these uncertainties. The nature of relationships within a project team is one of 'independent autonomy' with interdependence and uncertainty being in-built characteristics [7].

Project organizations are subject to a collection of guidance, from regulatory control to political and industrial intervention [8]. The uncertainties related to its design and construction environment are numerous (e.g., nature of the ground) [9]. There are also uncertainties that come from novice clients – there are almost always stakeholders for whom the project is a once in a life time project. To deal with uncertainty, various tools and techniques (such as risk management) are used; focusing on risk identification, risk analysis and risk response [10]. However, risk management assumes that risk factors can be identified and evaluated before they occur, and that necessary response strategies (or preventive methods) can be applied, particularly, through contractual arrangement [11]. In order to determine risk throughout a project's life cycle, a complete understanding of the complexity and dynamic nature of the construction environment is needed.

3. Multi ontology sense making framework

3.1. Sense making

Sense making is a framework that seeks to explain how people analyze unknown in order to act based on the analysis. According to Weick [12] (1995) sensemaking enables us to turn the ongoing complexity of the world into "a situation that is comprehended explicitly in words and that serves as a springboard into action" [13. Sensemaking

is done often with other people and so it contains 1) coming up with a plausible understanding –a map of a shifting world; 2) testing this map with others through data collection, action, and conversation; and then 3) refining, or abandoning, the map depending on how credible it is [14].

According to Weick [12], sensemaking is an ongoing process that is triggered when the current state of the world is perceived to be different from the expected state of the world, or when there is no obvious way to engage the world [13]. According to Weick [12], seven characteristics separate sensemaking from other explanatory processes such as understanding, interpretation, and attribution (table 1).

Table 1. Sense making process characteristics (based on Weick [12]).

Viewpoint	Description
Identity	One's perception of self affects the actions one makes. Individuals' self-concepts and personal identities are formed and modified partly by how they believe others view the organization for which they work.
Retrospective	People try to understand the present by looking what happened in past.
Enactive of sensible environments.	People often create partly the environment they live in, while the environment partly explains what kind of people they are.
Social	One has to fit one's activity in some manner to the action of others.
Ongoing	We change our mind when we see the results of our decisions
Focused on and by extracted cues.	People split moments out of continuous flows of moments and extract cues from those moments. We explain the same situation so differently
Focused on and by extracted cues	Different people learn different things and so they understand the situation differently
Plausible	Driven by plausibility rather than accuracy. Accuracy is meaningless when used to describe a filtered sense of the present, linked with a reconstruction of the past that has been edited in perception.

Dialogue and sense making enable the team to openly face its environment from different individual perspectives. Vygotsky [16, 17] argues that this leads to increased creativity within the organization, because each individual has more information, than only his/her own, to work with that is connected to individual's personal experiences. Innovating, however, should not be the intent intrinsically, but it should strive to achieve certain target as is the case in project work. Without innovative change, organizations stand in danger to petrify to shape of confusion and obsolescence [18].

3.2. From single ontology sense making towards multiontology

An ontology is a "formal, explicit specification of a shared conceptualization"[19]. Single ontology sense making means that professionals are trained how things should be. Trained young professionals believe that there is one way to run a project. Aramo-Immonen [20] recognized 11 features that effect on decision making in projects (table 1). One example is project schedule that project managers think is necessary for planning the project. Project managers go through a process based on the recipe to determine a desired end state, defined in terms of economic performance, behavior characteristics, etc.

Multi-ontology sense making argues that different tactics are appropriate, but within boundaries, and that methods and tools that work in one ontology do not necessarily work in another. Managers should know in which ontological domain they are operating, and what transitions between domains they wish to achieve. [2]

The systems theory brings structure and order to an otherwise chaotic project environment. By using the systems theory, different layers, subsystems, processes, and activities may be notable within a project. Parts of the organizational system are: a control system (e.g., accounting, quality assurance), a working system (e.g., production, distribution), an information system (e.g., information and communication technology), and a support system (e.g., purchasing, logistics). [21]

Table 2. Knowledge areas of the project management ontology [20].

Feature effecting decision making	Management discipline	
Project management Project complexity Resource planning	Project integration discipline	
Contract Pricing Local Content Demands	Project Scope Management	Generally Accepted Project Management Knowledge and practice
Management Processes Change Processes Behavioral Processes Work Processes	Process Management	
Capacity Timing Time Scheduling	Project Time management	
Management process Change Process Behavioral Process	Process Management	
Cost calculation Risk Analysis Lifecycle Costs	Cost and Uncertainty Management	General Management Knowledge Practice
Human Resources Management Capabilities Work Atmosphere	Human Resource Management	
Understanding Cultural Diversity Language Skills Information Technology	Communication Management	
Customer Strategic Fit Competitors Brach of Industry Market Opportunity Economic Trend	Market	Application Area Knowledge and Practice
Research and Development Technology Competencies Thread of Substituting Technologies Documentation Quality Systems Operative Execution	Product Integration	Application Area Knowledge and Practice
Social Stakeholders Supply Chain Management	Co-operation with Partners	
Infrastructure Nature	Environmental Impacts	

3.3. Ontology Epistemology matrix

Ontology is the branch of metaphysics that concerns itself with the nature of things. In this article we use ontology to identify different types of system defined by the relationship between cause and effect. The two-by-two matrix set out in Figure 1 contrasts the nature of systems (ontology) with the nature of the way we know things (epistemology) and accordingly the way we act since the knowledge and action are known to be closely connected [2].

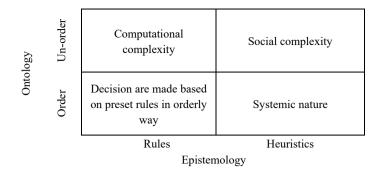|		Rules	Heuristics
Ontology	Un-order	Computational complexity	Social complexity
	Order	Decision are made based on preset rules in orderly way	Systemic nature

Epistemology

Fig. 1. Ontology epistemology matrix (modified using [2]).

The vertical dimension of the matrix contrasts two types of system, namely order and un-order. When we use objectives, planning and best practice, we work in an ordered system. There are clearly identified (or identifiable) relationships between cause and effect, which once discovered will enable us to control the future, then the system is ordered. It can be structured on the basis of a desired outcome with structured stages between where the project is 'now' and where the project wants to be 'then'. [2]

This is contrasted with un-order in which the relationships between cause and effect do not repeat, except by accident, and in which the number of agents interacting with other agents is too great to permit predictable outcome-based models, although we can control starting conditions and monitor for emergence. [2]

Ordered systems are those in which a desired output can be determined in advance and achieved through the application of planning based on a foundation of good data capture and analysis. In un-ordered systems no output or outcome can be determined in advance in other than the most general terms, but we can manage the starting conditions and may achieve. [2]

The vertical dimension of the matrix represents two distinct states, the horizontal dimension is more of a continuum between the low ambiguity of rules that can easily be made explicit and the more ambiguous use of heuristics or rules of thumb, which provide guiding principles but have high levels of ambiguity. [2]

This difference of rule and heuristic can be illustrated by comparing a construction project work that copies a newly built building in a new site with a value statement of company "we do not disturb the schoolwork while we are renovating the school". This value statement is a general guideline that is possible to be followed without detailed instructions.

4. Case studies

The case study material is got from the research project that studies inspiring learning environments where the researcher is looking for cross-organizational and cross-disciplinary collaboration projects. The author's research task is addressing university campus renovations and development projects. The case material is got both by observing the work and by interviewing the key stakeholders.

4.1. Case 1: Investment decision

Stakeholders are the property owner core team who make decision to start or cancel the project; and university personnel who are tenants of the facilities and often propose new construction project.

The property owner has several construction professionals working at the company. They have their own process to start the project. They need to see their tenant and talk together about the need. This formal process helps the owner and tenant to know each other's roles and responsibilities when the investment decision is done.

Analysis:

Process is rule based and orderly process from the property owner team perspective. The orderly rule based process is needed since the tenants propose often what to do and it is good that there is no need to reinvent the process for each case.

4.2. Case 2: Collaborative design

Stakeholders are the property owner team; facilities of charrette; university personnel representatives; student representatives; professionals of construction project.

Charrette is a collaborative planning and negotiation process. During this process the project stakeholders plan alternative solutions and further develop them into a concrete plan how the facilities are renovated. To ensure excellent result different kind of experts and viewpoints are needed, and the process should be situated at the site that is planned. There are several planning sprints that often contain the stages: ideation, conceptualization, presentation and connecting the ideas into a whole. In the process each stage contains a possibility to criticize the work of others when the results are presented. In addition there is a possibility to evaluate the integrated result of the workshops in open house event.

Analysis:

The process is orderly process and the participants use their expertise when planning step by step the plans. The decision making is systemic. Participants of the process don't necessarily understand the rules and the systemic nature of the process.

4.3. Case 3: Problematic situation at site

Stakeholders: construction core team (no actual users of the facility)

One of the key site workers got a long sick leave and the timetable was ruined. The site manager used his knowledge on how to solve the situation and with suppliers they could find a solution how to change the timetable so that the total timetable was not ruined during the time when a new site worker was searched for.

Analysis:

Unexpected situation (in other words un-order situation) in which the professionals think that the rule based thinking is easiest way to decide how to find a solution. So they calculated different options how to solve the problem and the easiest way was selected.

4.4. Case 4: Problem between stakeholders

During the construction project start up there was prioritizing problem with how much money the university was willing to use in the project. This was a surprise for the facility owner and the end users of the facility. In this case the plans were not enough for motivating. During the negotiation a solution was, however found.

Analysis:

Unexpected situation (in other words un-order situation) the rule based thinking did not give any favorable result. The group had to use negotiation and use past experiences how to find a solution (Heuristics).

5. Discussion

It is easy to describe how project managers make decision the extent to which extent the team uses rule or no rules and the extent to which orders or heuristics are used as the decisions are made. It is essential for a project the starting of the project needs understanding of the ideas of stakeholders heuristic evaluation of what is important and what is not important in other words use heuristic thinking.

The analysis reveals that the teams use reasonable decision making strategy. However, sometimes the decision makers might use incorrect style and the decisions will give later challenges. For example, if the project plan is not clear enough the orderly ruled process should be postponed until the goals are clear and there is enough reliable information to make the normal schedule and budget.

During the construction stage it is easy to use orderly based ontology and calculate the required saving using heuristic thinking by guessing what do the stakeholders value. This way the project team attempts to avoid complex situation with property owners and end-users of the facilities that would require probably long discussions to select which kind of solution is best.

Project management core team pursues to keep the project in orderly manageable route. However, there are

always situations where there is no order and the selection of rule based or heuristic way needs to be done.

6. Conclusion

Project management literature describes projects as rule based and orderly manageable effort. However this case study illustrates that there are situation where the hermeneutics or/and un-order exist when making decisions. Different decision making situations should be considered when project management core team makes decisions.

Understanding the decision making landscape helps the project management core team or the project manager to recognize the situation and select the proper decision making style. The awareness of decision making styles helps the project core team to further develop their work.

In future work, several case studies should be systematically analyzed in order to illustrate to which extent project management core teams us rule based epistemology and orderly ontology. Also the guidelines of project managers should be analyzed using this framework so that the development areas of guidelines could be improved accordingly.

Acknowledgment

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