Scope Change, Flexibility and the Management of Projects

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ABSTRACT

Managing scope on projects is universally recognized as a challenge for business. This paper will argue that the activity theory concept of contradiction is a useful method with which to re-frame debates around the origins of scope change that moves away from an either or approach to based on trade-offs between for example efficiency and flexibility. Scope change will be demonstrated to be a natural part of projects, and that managers who embrace it can benefit from the opportunities that arise. Using one live manufacturing project as a case example, the paper will conclude that both hard and soft paradigm stances in terms of project management can be accommodated under the activity theory banner of contradiction, giving rise to the potential transferability of this classification across all types of projects.

Keywords: Project Management; Manufacturing; Cultural Historical Activity Theory (CHAT); SME's; Scope.

1. Introduction

Scope change on projects can be very challenging for managers as it can be an admission that the original plans were inadequate, thus calling into question the expertise of the people who planned the project. Consequently when scope change results in time delays, budget increases, and disagreements about quality, this can often lead to evaluations of projects as failures and the Standish Chaos Report (GROUP 2008) is a good example of this attitude. However scope change need not always be seen as negative, to the contrary as Olsson (2006) has observed:

> "flexibility can enable utilization of the often neglected opportunity side of uncertainty management" (pp: 73)

To demonstrate this a live manufacturing project was chosen as a case study to investigate the relationship between planned and actual action. The case is part of a wider work in progress into the management of projects from an activity theory perspective (Nardi 1996; Engeström 1999; Hasan and Gould 2001). This paper will argue that managing flexibility in projects (Olsson 2006; Cui and Olsson 2009) is core to project actuality (Cicmil, Williams et al. 2006; Cicmil, Williams et al. 2006; Cicmil, Cooke-Davies et al. 2009), and conclude that the activity theory concept of contradiction is a useful lens with which to re-frame attitudes towards change on projects.

2. Literature Review

Several authors have approached the issue of flexibility on projects in recent years. Complexity theory for example has been applied to multi-project firms facing chaotic environments where a balance between contradictory stimuli is present (Geraldi 2008;

Geraldi 2008; Geraldi 2009). Likewise the tension between efficiency and flexibility in the practitioner driven field of project management has been discussed, with the limitations of planned versus reactive flexibility explored (Olsson 2006; Olsson 2006; Cui and Olsson 2009). That this tension exists has been clearly identified and responses to this are documented in various novel and proprietary methods of decision-making (Pundir, Ganapathy et al. 2007; Steffens, Martinsuo et al. 2007; Paslawski 2008; Highsmith 2009; Williams and Samset 2010).

However the focus of this paper is not about evaluating all the possible methods available to a project manager or organization in dealing with flexibility. Nor is it about providing another case study demonstrating the existence of this tension. Rather this paper seeks to explore what fundamentally generates this paradox from a cultural historical activity theory (CHAT) point of view. The reason for this is to attempt to provide one plausible explanation that is transferable to all projects, a basic and fundamental explanation of the ongoing surfacing of contradictory stimuli experienced by managers of projects.

Activity theory has been chosen to make sense of this tension between planned and actual action, as it is a well-regarded lens for the investigation of organisations and their work practices (Blackler 1993; Blackler 1995; Blackler, Crump et al. 2000; Engeström 2001). Recent applications of this have been extended to studies of projects in organisations targeting areas such as communication, knowledge sharing, learning, boundary objects and change management (Aramo-Immonen and Porkka 2009; Vakkayil 2010; Ludwig 2011; Shih, Shaw et al. 2013).

Project management research has tended to carry with it a kind of bounded rationality, similar to what has been observed in wider organization studies (Blackler 2009), where solid organizational structure is assumed and taken for granted. Contrary to this, activity theory argues that organization is an emergent network of interacting activities (Engeström 2001; Blackler 2009). Driving these emergent systems are contradictions within and between elements of the activities that expand and evolve over time. Activity theory also states that contradiction can arise when there is a clear gap between actual practice and a better imagined or observed future practice (Leontjev 1978), where the individual is motivated to change based on a perceived better outcome than the one they have now. It is this concept of contradiction that will be applied here.

3. Method

Researching what generates scope change on a live project required the use of several qualitative methods of data collection and analysis. Firstly to re-construct the project for analysis a narrative approach was chosen combining data collected in interview, project documents and online records such as websites and archives. This is done for the dual purpose of triangulating accounts of the project, along with producing a story that may be familiar in parts to readers (from their own experiences) allowing their insights to challenge those of the researcher.

The second method used was a thematic analysis of the manager's accounts of the

project when interviewed. Thematic analysis of interviews allows the researcher to identify what was important for the participants in terms of feelings and emotions expressed in relation to events that occurred in their life (Miles and Huberman 1994; Boyatzis 1998; Cassell and Symon 2004). In this case thematic analysis was used to analyse what the responses to scope change were in the project in terms of the actions taken by the managers and the motivations for that where present. The third and final method used was an activity theory (Leontjev 1978; Vygotskiĭ 1978; Engeström 2001) analysis of the generators of scope change on the project. The narrative, thematic and activity theory analysis now follows.

4. Case Narrative

This project is discussed from the point of view of the two people managing it at the time of the research; they are the project manager (PM) and the marketing manager (MM). The project selected was an entrepreneurial activity of a small electrical firm in Australia. For the remainder of this narrative they will be referred to as the PM & MM respectively.

4.1. Background

The PM has more than four decades of experience in the electrical industry, having started as an electrical apprentice, they moved their way up in the industry as an electrical contractor, engineer, business owner and now PM of a new start up, whose sole focus was to develop a new lighting product for the market. The motivation for beginning the project was that they had sold out of their long time business (25 years ownership), but in their words still "had a passion for the industry" (PM) and wanted to take advantage of what they saw as an underutilization of existing technology in the market place.

Through their direct experience they believed that the older technology still has potential for improvement and optimization, which could continue to out-compete newer technologies in the short to medium term. The newer technology, they claim, is still in infancy and that organizations who buy into it are at a "huge risk" (PM) of the product being rapidly superseded, as the newer products are early in their development life cycle. However the older technology has proven reliability and a much greater chance of maintaining performance over the lifetime of the purchase. This type of product lifecycle management refers to the ability to continue to engineer a product through improved materials and manufacturing methods to extend the usefulness of the product in the eyes of the consumer, and is recognized as a factor in product success (Ameri and Dutta 2005; Stark 2011).

The PM had observed a trend where the "circle has been stretched" (PM) in that the diversity and rate at which new technology enters the market is increasing, making it difficult for producers, consumers and regulators alike to make informed decisions. Concurrently in the eyes of the PM there are wider issues around the dual constraints of economic and environmental performance where the product must satisfy both of these to be desirable. Contributing to this situation the PM expressed concern that parliamentarians, "who speak allot about things they don't understand" (PM), have

regulated for as yet un-proven technology to satisfy vocal sections of the "green movement" (PM) such as the "Al Gore's"(PM) of the world.

4.2. The Project

In order to carry out the project the PM had to establish a dedicated space for the research & development (R&D) of the new product. This consisted of a new work premises fitted out with the required technical equipment, along with the recruitment of skilled staff to assist in administrative tasks, book-keeping, industrial design, and later marketing. As the R&D progressed over a two year period it was necessary for the PM to then consider how to take the product from a novel invention to a mass produced item, the initial proposition was to then make a purpose built facility for the manufacture, production and distribution of the product, but this was to change due to prevailing market conditions and the possibility of a government grant.

Towards the end of the R&D phase of the project, peers advised the PM that the Federal government was offering grants for the commercialization of new products by Australian businesses. In order to follow this path the PM would be required to apply for the grant and account for the value of the project to an external party, which concerned the PM who when asked replied "I knew there were grants out there but I didn't really bother with it because I've always been totally independent of relying on others" (PM). The PM was worried about the obligations that would be imposed by the government, having been successfully self-employed for many years and used to doing things their own way.

This concern though was tempered by the fragile economic situation due to the global financial crisis, and the fear of the PM that they were the sole investors in the project. Trusted advisors also cautioned the PM that there was a chance they could lose their entire investment, and that a successful grant would be some sort of insurance against that. Weighing these concerns up the PM decided to take the advice in resolving this dilemma, as they had first-hand knowledge of engineering businesses that were struggling to survive, with many folding as a result of the dire economic environment.

The application process for the government grant involved a number of steps where the PM had to describe in detail the merits of the project. This included justifying a need for funding, demonstrating the market opportunity, explaining the value proposition for the customer, an execution plan for the project, management capability and national benefits. The process was "more documented" (PM) than what they were used to and delayed the project by eight months. Then grant application was successfully though when asked they replied that they "knocked it back" (PM) as it was hard to justify the loss of time, effort and cost in going through the lengthy application process.

Upon award of the grant they were tied to a strict timeline imposed by the agreement that included regular progress reports and updates. Also as the grant was for innovative projects there had to be some sort of intellectual property (IP) attached to the outcome. The PM expressed this stage of the project as having to get "some form of protection" (PM) against having the product copied or imitated by a competitor, a well-known risk in R&D projects (Mansfield 1986; Granstrand 1999; Blind, Edler et al. 2006). However as a small firm the PM was deterred by the cost of patenting and decided on design registration (Hall 1992). A registered design gives the owner exclusive rights to commercially use, license or sell their design in the countries that it is registered in. In

this case the design was registered in Australia, Japan, Europe and the United States.

Once the project resumed its course delayed by the grant, the PM had to make a decision around the balance of insource to outsourcing of production. Their initial plan detailed in the grant application, was to build their own factory from scratch. However there were concerns about market stability due to the global financial crisis (GFC) and not being able to get "enough volume to sustain ourselves" (PM) as many businesses were folding due insufficient "orders" (PM) for their products. The upside of this situation though was that there were many factories in need of work, and it was this path the PM followed in sourcing a production partner

Outsourcing and management of supply chains is a well-known issue for business (Beamon 1998; Beamon 1999; Mentzer, DeWitt et al. 2001; Christopher 2010) and is reflected in the management of this project. In this case the major supplier or partner was found by accident while the PM was waiting for a meeting with another supplier in an industrial district. They recognized the sign of a business known to them and simply knocked on the door. Interestingly both parties knew of and trusted each-others work and ability to deliver. Fortuitously the company was fully equipped for what was required and due to the GFC had excess capacity in production. This development changed the purpose and function of the PM's project in that they now became the "project developer" (PM) with the new partner now responsible for the "manufacturing" (PM) of the product.

The arrangement made was to be able to issue orders based on demand and to the specific design issued by the PM's business. In order to facilitate this the PM also had the design certified to Standards Association Australia Certificate of Suitability, which they said they "didn't need to do" (PM) however this would give "credibility in the market" (PM). The trade-off though was another 18 weeks delay "which was very painful" (PM) but they said they were not going to market without certification.

As with the grant application and the decision to build or outsource, the PM was clearly making critical decisions about how to progress the project that had time and cost implications, but they chose to take a path to higher quality demonstrating a willingness to be flexible in the face of change. The time, cost, quality constraints are well known in the project management literature (Khang and Myint 1999; Turner 1999), and in the case of this project quality was very important to the PM. It was at this time the project transitioned to a new phase of development, marketing.

Although the value proposition for the customer had been established in the grant application, and the PM's experience of the industry all pointed to market opportunity, it was now time to try and get the product into the market. The PM is a technical expert on the product, however they at the time were not confident on the marketing required to help the project succeed. In order to do this, though, would require hiring an expert and sharing management responsibility for the project. Having been the sole manager this was a challenging step with the PM clearly stating that they needed someone who "could do the job" (PM), who they can "trust" (PM), a "friend" (PM) pointing to the critical success factor of interpersonal relationships to this project. Marketing is a fundamental tenet of mainstream business and is taught in most business degrees along with being a must on most business plans (Kohli and Jaworski 1990; Kotler, Brown et al. 2004; Dibb,

Simkin et al. 2005; Kotler 2009). However marketing is less well known in the project management literature though the importance of the relationship between the project, the organisation and the market or external environment is beginning to gain traction (Skaates and Tikkanen 2003; Cova and Salle 2005).

The PM recruited an expert in marketing that they had known for "many years just through business relationships and also a friendship" (PM), and had a proven track record in the area. The attributes of this person fitted the earlier expressed categories of trust, friendship and expertise. Luckily this person was also available at the time and welcomed the appointment, though there was a steep learning curve as the PM had to teach the new marketing manager (MM) about the industry. Although marketing is a skill in its own right and in the words of the MM a skill set that can "go from one industry to the next" (MM), in the case of this project though, specific technical knowledge was also seen as a fundamental requirement.

This observation of the PM is a little at odds with mainstream project management literature that view's technical expertise as a relatively less important skill than human, conceptual and organizing skills (El-Sabaa 2001; Brill, Bishop et al. 2006; Sunindijo, Hadikusumo et al. 2007; Pant and Baroudi 2008). This points to a possible divergence between what project managers actually do and what the literature says project managers should do. Technical skill is also a notable absence from project management competency frameworks (Cheng, Dainty et al. 2005; Turner 2007). The MM recruited was also very accomplished, and had more than two decades experience in sales and marketing at all levels of management. They were also excited to work on the project as it offered the opportunity to take everything from "ground zero" (MM), and when asked noted that the PM is "passionate about the quality" (MM) of the product. The MM's job was to determine the right approach to having the product accepted in the market, and had become the first point of contact for the project, a role the PM had managed thus far.

In order for the project to succeed the MM and the PM were faced together with a significant dilemma for the project, further challenging their attitude towards flexibility. Should they sell direct to the customer, should they sell wholesale to an electrical supplier, and in terms of the price how would this be managed from country to country. The PM had identified that "it's no good building a product if you can't sell it anywhere" (PM), so without being able to sustainably sell the product the entire project would be a failure. Additionally there was the technical challenge of making the product readily and easily usable by the market sector they were targeting.

The market was identified as consisting of a range of businesses both in terms of size and in terms of the receptivity to simple or complicated technology. Driving this was a wide spread concern about energy consumption and how to control this to reduce costs where "most industries don't really want to go high tech" (PM), but big corporates "can afford it and have got people who can project manage it" (PM) however the small enterprises don't have those resources and want to "understand it" (PM) and get "good value for money" (PM) as their resources are far more limited.

Another dynamic identified is the transparency of price of product between country to country, and the ability of people to buy over the Internet changing the producer-customer dynamic. An example given was that "there will be some point where overseas

prices becomes visible to Australians in your local market" (MM) which can be very damaging for customer relations as the Australians may feel like they are being over charged by greedy local suppliers. Coupled with this are issues around the procurement policies of complex organizations (potential customers) with "with hundreds of branches and a head office that likes rebates and those rebates can be tiered" (MM) trying to balance the actual cost of purchasing after taking advantage of different rebates and taxes available across jurisdictions. The Australian Competition and Consumer Commission was cited as a known hazard in Australia, as buyers and sellers tend to sail as close to the wind as possible in order to maximize profit.

Achieving the marketing objectives of the project not only required an understanding of markets and prices by the managers, it also required a fine grained understanding of how the industry is structured so as to approach potential customers successfully. Although various media (print, T.V, radio, internet) were cited as important, the most important avenue identified was "word of mouth" (MM) so as to be able to "get in front of people" (MM) and "blow your own whistle" (MM) so to speak. This points to the importance of establishing business relationships (Snehota and Hakansson 1995; Cannon and Perreault Jr 1999) and the theory that personal contact is the core aspect that connects the actual actors (Holmlund and Törnroos 1997) between businesses, beyond the formal bonds of contract.

The final piece of the marketing puzzle was to pilot test the product in suitable locations so as to demonstrate the effectiveness and value of the product, and to also have model customers associate their name with the product to gain greater credibility. Pilot projects were seen as a "good test process" (PM) to get the product into the market and show customers that they deliver what they promise. Pilot projects are quite common in manufacturing as they allow for refinement of products based on customer perceptions and are seen as a contributor to success (Bob 1989). This project was able to successfully complete fifteen pilot projects, which now feature prominently on their website and are a cornerstone of their identity.

The project has now passed into the commercial phase where the product is available for sale. The project has an active website that details the product and is a central point of contact listing specifications and suppliers. Following the final development of the product it is now available via the company factory or through partner distributors, electrical contractors and wholesalers. They have also successfully completed the grant obligations and are now fully on the market. Only time will tell now how successful the project was in achieving the PM's goals.

5. Thematic Analysis
Both the PM and MM were interviewed about the project with their responses analyzed for recurring themes. From this six categories of themes were produced based on the sentiment expressed by the managers around events on the project as follow;

i.   Awareness of relationship and integration with other specific activity systems, and shared objects and the value of this to all parties involved. This was a recurring theme and expressed by both managers. An example of this is the quote "they were a good test process for us to get our product into the market" where configuring the activity system based on the product (transformed object) shared

by them and the numerous pilot projects undertook was as a way of testing whether other customers similar in nature (activity system) to the pilot partner. This showed both an actual and abstract conceptualization of a network of activity systems emerging.

ii.   History of work as important to identity. Both managers expressed strong sentiments about the background and experience of themselves and the people they chose to work with as important. For example the quote "I've always been totally independent of relying on others" infers a judgment on what it takes to manage this activity. Further more both managers found it necessary to discuss their career background to legitimize their position in the division of labor. This is also reflected in their choice of staff and business partners.

iii.   Orientation to the market. Marketing featured prominently as a theme throughout the interviews and is reflected in the website of the business. With comments like "it's a retracting market" it is clear to see that both managers see marketing as a major success factor in the project. Marketing was attached to their website, the product, choice of customers and method of distribution.

iv.   Positive outcome of the activity, positive relationships and motivation. These dual themes around perceived positive activities and relationships were expressed in relation to within the project and between the project partners. These feelings were expressed strongly with quotes like "fantastic working relationship", "good firm working on it", and "the exciting thing for me" pointing to strong motivations behind the managers involvement in the project.

v.   Structure and viability of the activity system in terms of subjects and division of labor. The divisions of labor, specific working relationships, process improvement and evolution of these were a core theme in relation to how the project evolved. This was specifically targeted to how the activity system of the R&D factory functions.

vi.   Minor themes were identified as beginning something new, being different and better, and constrained by time.

6. Activity Theory Analysis

Major Change on the project could be accounted for by the activity theory of contradiction as follows;

i.   Applying for the government assistance grant is the first example of a contradiction driving change on the project. Although the project manager was used to being independent they were "satisfied that it was the right decision so it was good" to have followed this path. This change involved bringing in a new and unknown stakeholder to the project that caused changes in physical and mental activity introducing new objects and tools to the system such as documentation and reporting as well as delaying the project for some time.

However the benefit of receiving a $700k grant outweighed the concerns of the manager. This had an effect of satisfying one of the motivations of the manager, financial benefit, while at the same time increasing the complexity of the activity system. This confirms the argument that the technological small to medium enterprise tends to become more complex over time in order to have an adequate network of resources to achieve their goals (Rothwell and Dodgson 1991).

ii. Choice of production method also demonstrated a contradiction between the current activity and future possible activity as well. The project manager with decades of experience in the industry was used to doing things themselves and driven to control the whole process in house. This was demonstrated by their establishment of an R&D office followed by scouting for premises to manufacture and distribute the product. However the prevailing economic conditions that also drove their decision to apply for a grant, led them to seek alternate solutions. It is important to re-state here that they were proudly independent, and their first choice was to do everything themselves. Finally choosing on outsourcing the production resulted in a change in the identity of the project to product developer. This in effect changed the object of their activity to a provider of knowledge as opposed to a producer of a physical product. The project was now a union between three activity systems; the project developer, the manufacturer, and the financial investor. This resulted in the complexity of the project increasing as the goals and motivations of three systems now needed to remain aligned.

iii. When the project manager recognized that to launch this product specialist marketing skills were required they were unable to source this within their organization. This resulted in bringing on a new person to assist in managing the project, which further reduced the control, the project manager had over the project. The project team now had to align to the appropriate marketing strategy and change the object of their activity in order to achieve their goals of having a successful product. This drew the project manager into a relationship of distributed cognition of what the project was all about and how to manage it (Nardi 1996). However in order to this the fundamental principles of trust, relationship and shared history were required to achieve a satisfactory bond.

iv. Following on from marketing was the choice about how to sell the product. This required choices around wholesale and retail as well as local and international markets. Contained in this were an implicit understanding of the technical and market complexities involved, where the project and marketing manager had to negotiate with potential customers about the benefits and use of the product. Building these bonds with other organizations (activity systems) was further evidence of the need to build even more complex networks of activity systems in order to achieve the core goals of the project. This required flexibility in the activity system in terms of tools used, object of activity in the form of the purpose of the product, and the shared outcomes for all parties involved.

7. Discussion

Significant themes emerging from this project were related to the major changes that occurred in seeking grant funding, sourcing a manufacturer, hiring a marketing manager,

and determination of the marketing method. Essentially these themes were related to responses to contradiction and can be viewed as a fundamental change in scope of the project. Causes of scope change in project management have been linked to quantitative factors such as poor definition, estimation and tracking of cost, time and quality (Turner 1999; Kerzner 2013), and qualitative factors such as changing goals and expectations of stakeholders, and other environmental factors external to the project (Cleland 1986; Elias, Cavana et al. 2002). These factors are also often referred to a hard and soft management problems, which have been difficult to resolve under one unified theory.

Core to this is establishing a firm scope early in the project that is maintained, as there are many examples of how expensive it becomes to change scope as the project progresses. However in this project changing scope was seen as a positive outcome that enabled for better physical and knowledge resources for the project. In effect the project scope had to change to achieve the initial goal. This arising contradiction between the perceived current and future state of the project by the manager appears to have been a positive experience, resulting in benefit to the parties involved.

The theme "history of work as important to identity" demonstrated an awareness of the role individuals play in fitting into the desired activity systems and is related to primary level contradiction, where the acts of individuals need to meet future needs. The theme "structure and viability of the activity system in terms of subjects and division of labor" showed awareness of secondary level contradiction and the need to integrate individuals and the acts they undertake at an activity system level. The theme "Awareness of relationship and integration with other specific activity systems, and shared objects and the value of this to all parties involved" demonstrated awareness of tertiary level contradiction between activity systems and the need to integrate these in a favorable and beneficial way. And finally the theme "Orientation to the market" demonstrated an awareness of the wider context and an awareness of quaternary contradiction, in that the new product challenges ideas and perceptions at a societal level.

8. Conclusion

In bringing this all together it is hypothesized that the concept of contradiction (Leontjev 1978) within and between activity systems (Engeström 2001) from an activity theory perspective may be a suitable theoretical construct to use as a unified theory to describe the drivers of scope change on projects therefore unifying quantitative and qualitative explanations of this under one banner. This has been demonstrated on one live project, and integrated with previous project management and activity theory research. However as this has only been demonstrated on one live project it is proposed that contradiction and third generation activity theory be tested on live projects from other industries to see if the themes identified in this paper are shared in different contexts.

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