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Adopting Agile in a large organisation

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Abstract. Much has been written about adopting agile software development within a large organisation. A key aspect of this significant organisational change is to ensure that a common understanding of the new technology emerges within all stakeholder groups. We propose that an analysis framework based on the concept of Technological Frames (TFs) can identify where understanding is in conflict across different stakeholder groups. We used TFs to analyse data collected in one organisation in the process of adopting an agile development approach. In doing so, we identified several dimensions (called 'elements' in TFs) which characterise a group's understanding of agility. In this paper, we present these elements and describe the TFs for four distinct groups. We suggest that these elements may be used by other organisations adopting agile methods to help understand the views of different stakeholder groups.

Keywords: technological frame; human aspects; empirical; qualitative

1 Introduction

Many aspects have been identified as important in the process of adopting agile development, especially in a large organisation. For example, which practices to adopt [1], how to accommodate restrictive regulations [2] and how to balance repeatable processes with uncertainty [3]. A key issue underlying these concerns is the need for a common understanding of the new technology within all stakeholder groups. But where will conflicts arise in this process? How can different groups be helped to converge on a common understanding?

The aim of this paper is twofold: to suggest that Technological Frames (TF) [4] provide a useful analysis framework for studies wishing to answer these questions; and to present the results from such an analysis of one organisation. TF analysis helps to identify the elements that shape the process of translation by the key stakeholders [5], and hence offers a way to characterize where differences may arise. Using this framework provides a snapshot of the assumptions, knowledge and expectations of stakeholders during the adoption of agile methods in an organisation, and the practices constraining, framing and emerging in this process. To illustrate how TFs may be used, the specific framework of elements derived from a qualitative case study of one organisation adopting agile methods is presented; this specific framework may be a useful starting point for others attempting to understand conflicts between stakeholder groups.

Section 2 introduces key literature on adopting agile development in a large organisation. Section 3 introduces technological frames. In section 4 we present the qualitative case study from one organisation. The analysis and interpretation of how

“agile” is defined and implemented by the different stakeholders is presented in Section 5. Section 6 discusses our results; section 7 provides some conclusions.

2. Adopting Agile in Large Organisations

Software process changes represent complex organisational change and cannot be accomplished merely by replacing tools and techniques [6]. Adopting agile development is no different from other organisational change events in this sense, and several authors have identified key challenges from their experience.

Lindvall et al [7] identify the greatest challenge to adopting agile practices as being the need to integrate with the existing environment, while Cohn and Ford [8] say that failing to persuade any stakeholder group to use the new process can impact negatively on the project’s outcome. Both of these emphasise the need to understand the wider organisational culture as well as the processes and structures that support it.

Boehm and Turner [9] report the results of workshops aimed at identifying barriers to agile acceptance in large organisations. They describe three groups of issues that act as barriers to agile adoption: development process conflicts, business process conflicts, and people conflicts. People conflicts are identified as the most crucial to the success of agile adoption.

At a more fundamental level, Weyrauch [10] points out that a common language needs to be developed between stakeholder groups. However this is not simply a matter of using the same vocabulary since this common language also needs to represent the same concepts.

3. Technological Frames

A TF is made up of two parts: elements of interpretation and elements of practice [4]. Elements of interpretation include assumptions, knowledge and expectations about technology which shape a group’s understanding of the new technology, while elements of practice describe the constraints from their existing practices on adopting the new technology. The study of practices includes the existing network of artefacts, such as manuals, policies, etc. and the practices they represent. Underlying the TF view is that a community can be divided into different social groups. All members of one group share the same TF to various extents, but different groups may have different TFs. Understanding a group’s TF with respect to a particular technology uncovers how that technology is being viewed by that group, and hence may identify conflicts between groups.

The TF concept was originally developed to understand the sociocultural processes that guided the interactions of groups of scientists and technologists in the invention and development of a number of technological artefacts - the bicycle, bakelite and the fluorescent lamp [4]. Subsequently, TFs have been used to investigate other kinds of technological change. Some studies, e.g. [11], use the concept of TF to successfully explain in what ways groups differ in their interpretation of systems and how this leads to changes in the way they are designed and adopted. Others have used TFs to understand conflicts among stakeholders: between producers and users of ERP software [12]; in the adoption of intranets in large organisations [13]; and in participatory design [14]. In this study, we use TFs to understand the conflicting perceptions of stakeholder groups adopting agile methods in one organisation.

A key characteristic of sociotechnical change is that groups in favour of the new technology tend to view existing practices as problematic, whereas groups not in

favour of the technology say that the problem lies in the new tools. This key element of TF construction is referred to as 'problem locus construction' [12].

4. The empirical study: data gathering and analysis

4.1. The Case Study Organisation

The organisation provides voice and data services around the world, building a 'new wave' business based upon networked IT services, broadband and mobility and is divided into several businesses, one of which focuses on software development. The organisation employs approx 100,000 staff, about 7500 of whom are software developers. Their headquarters is located in the UK, although a large portion of development work is carried out off-shore. At the time of study, the agile adoption process had been running for approximately 2 years. The main thrust for agile adoption came from the software development business where the CEO mandated it, and it is here that most adoption work had been accomplished.

4.2. Data gathering

Data was gathered through a variety of techniques including individual interviews, observations, face-to-face and telephone meetings, documents, and a wiki. We attached ourselves to one project (Project Z) and also gathered data from representatives of stakeholder groups not part of this project.

Project Z was chosen because the individuals involved in the project had shown willingness and interest in adopting the agile approach, and hence had tried to understand the technology.. Also, the contractor working with the team developed code using some agile practices, which we thought might influence Project Z's adoption of agile. Four people involved in Project Z were interviewed: the delivery manager, the user experience manager, the technical architect, and an outside contractor. One user stories meeting which included customer representatives, developers and agile advocates, two user interface design meetings (by telephone with an off-shore contractor), and two delivery meetings (by telephone with an off-shore contractor) were observed.

Three agile coaches, and members of a four-person agile development team not connected to Project Z were also interviewed. The team was observed for two days. Data consisted of interview summaries and transcriptions, meeting notes, observation notes, artefacts and images, wiki pages and documents. In the interviews we were keen to investigate what the individual understood by the term 'agile', what their experience of agile was, and what it meant to them in their day-to-day work to apply agile principles. A semi-structured interview style was therefore adopted, allowing individuals to discuss other agile-related issues if they seemed important to them.

During observation we looked for examples of the use of agile terminology, evidence that an agile approach had been adopted to any degree, and whether the push to adopt agile methods had impacted on normal work patterns.

A key document was a manual of agile development which captured the particular flavour of agile that the organisation was adopting. The online tracking system and repository of information (a wiki) for the four-person agile development team was also an important artefact. A particular emphasis in all the data gathering was to

identify examples of conflict or breakdown [15]. TFs seek to understand how adopters interpret the new technology, and so studying breakdowns helps to explicate TFs.

4.3. Data Analysis

Following Critical Discourse Analysis (CDA) [16], the data was regarded as text reflecting stakeholders' interpretive frames and actions, which, in turn, were taken as an indication of the social context and ideologies surrounding agile adoption. People's interpretive frames are considered to have discursive properties, in accordance with the ideas of [17]. Following the TF framework, the data was analysed to identify elements of interpretation and elements of practice. Therefore the TF framework provided a top-down view of the data, and CDA provided a perspective for analysis from the bottom-up.

Analysis focused on the situations of instability and fluctuation in which the value and usefulness of agile methods was defined. This process enabled the comparison of stakeholder groups in terms of their different TFs.

5. Results: making sense of agile

Accounts about agile and its uses were present in interviews, observational data, policy documents, and on the wiki. Data analysis identified four elements of interpretation and five elements of practice that shaped how agile methods were defined and adopted within the organisation. These elements divided our participants into four groups each with a different TF. These elements and groups are shown in Table 1. In the discussion below, we summarise the key observations for each group.

5.1. Agile advocates and coaches

A group of Agile Advocates and Coaches is driving the agile 'push'. Their mission is to disseminate knowledge of agile methods and facilitate their successful adoption across the organisation. From a TF perspective, this means that advocates must persuade other staff to adopt the same elements of interpretation and practice to frame agile adoption as their own. One of the biggest challenges they were facing was to move Agile from the development teams into the rest of the business.

Elements of interpretation. Agile was seen by the advocates and coaches as a flexible development method that represents a natural way of doing things – as “*a subset of common sense*”. They see agile as delivering “*what the customer wants not what they asked for*”, and this reflects their understanding of agile as enabling an increased collaboration between developers and other stakeholders.

According to the advocates, increased collaboration does not mean letting customers and users fully steer the process of design and development, however. Instead, usability professionals and other user researchers from within the organisation should help customers and users to make decisions. We only saw one instance of this happening where a user proxy attended a user story workshop.

This group believed that the collaboration brought by agile should benefit all areas of the business not just the development effort, including groups such as marketing and retail. They saw the applicability of agile as being across the entire business.

Overall, the value seen by this group for agile adoption is increased customer satisfaction. As one lead advocate reported, the motivation to bring agile into the organisation was “*to be responsive to the changing needs of the business*”.

Table 1: Technological Frames relating to Agile for the four groups identified				
	Advocates and Coaches	Agile Team	Project Team Z	The Business
Elements of Interpretation				
The value of Agile for me is	Customer Satisfaction, Responding to changing needs of business and market. Re-use.	Customer Satisfaction, Business Value, Continuous Delivery	Faster delivery, Structure to what we do. Re-usability.	Redundant
Applicability of Agile	Entire business process	Software Engineering	Entire product process	N/A
Project Scope should be	Flexible	Flexible	Fixed (but understand rationale for flexibility)	Fixed
Increased collaboration for a better product	Agree	Agree	Agree	Agree
Elements of Practice				
How to be agile	In negotiation: coaching, workshops, training.	Highly defined	Ad Hoc (willing to bring Agile for structure)	Highly Defined User Research
Tools and Artefacts	Agile manual, change process documents, wikis, online resource. story cards, MRDs.	The wall, user story cards, charts, wikis, audio 'culture'.	Ad Hoc: excel sheets, wireframes, flowcharts, audio 'culture', MRDs.	Audio 'culture', MRDs.
User Input	Workshops and meetings before and during the production process.	Continuous, they should be part of the team.	Only before production process. Then deadlines more important - but want to change	Only before production process. Then deadlines more important.
Problem Locus Construction: Agile vs. Existing Production Process	Agile will improve production. Senior Management Confirms this.	Agile will improve production. Senior Management Confirms this.	Agile will improve production processes, but do not know how.	Agile is not adequate for our product research processes. On the contrary, it is redundant.
Workarounds on adoption	Translating Agile to entire business: - User stories from MRDs. - Business Scenarios	Retrospective writing of detailed documents to fit the organisation official processes.	Extracting User Stories from MRDs	N/A

Elements of practice. One reported practice directly aimed at introducing agile methods was ‘embedded coaching’, where a coach joined a team of developers and transferred knowledge to them. However there were too many teams for the number of coaches, so new coaches were being trained. Translating agile principles to the rest of the business was attempted through special workshops and presentations. This was complemented by events of public recognition such as internal ‘Agile Awards’. A key tool was a manual of agile adoption generated by this group, but it was not designed to carry agile methods beyond software engineering, i.e. to the business environment.

In terms of problem locus construction, advocates highlighted the inflexibility of current production processes as being a problem, while middle managers questioned the ability of agile to be integrated with current practice. The main mind shift required according to them was the need to think of projects as having flexible as opposed to fixed scope. One of the advocates said in this respect: “*it is a big cultural change. We develop what we need and we keep things flexible.*” To overcome this, the advocates developed workarounds and ways of knowing how agile a team has become. The agile manual lists five principles of agility: customer involvement, user stories, iterative development, automated testing and continuous integration. Advocates have translated what each of these means to non-development staff but not all stakeholders find this translation logical or relevant to what they do. One instance of this translation is creation of ‘business scenarios’, which attempt to capture not only the IT activities but other activities related to the product, including technical and market research. As one of the lead advocates said, “*there is no point in delivering an IT solution if the business has not done its job*”.

Summary. The TF of this group constructs agile as delivering a product of increased quality that responds to the changing needs of the market. Most of the knowledge publicly accessible refers to software development and not to product design and research.

5.2. The agile software development team

Of the four groups described here, this one followed most of the agile manifesto principles. They mainly delivered internal systems and their interpretation of agile was more focused and consistent than that presented by the advocates and coaches.

Elements of interpretation. The team was proud of being agile and valued the approach: “*It is not just doing one or two things to tick a box. It is the whole methodology that counts. We can deliver if we want every two days. The fact that we can do that shows that we are agile. The customer is very happy!*” They used agile to identify themselves as different from the rest by claiming that several areas within the organisation did not understand what agile is.

A central element in their interpretation of agile was collaboration with the customer: they were able to discuss the product with customers on the same level, delivering a solution closer to their needs. The team leader developed this point by saying “*it is 'I need to speak to my customer and see what he says' rather than thinking 'this is my requirement I will go and do it'. The key change is to consider the customer as a part of the team and help them to get the most business value from the system.*” Customer collaboration was viewed as being able to deliver business value to the development process and its product. Indeed, they saw agile as a set of software engineering practices that help to deliver business value and they all believed that agile requires a mental shift where the scope of the product remains flexible.

Saving wasted effort was another defining idea: *“Being agile is about continuously getting feedback. You deliver small things quickly and then you build on them so you save a lot of wasted effort. Historically we used to deliver things that were not used.”*

Elements of practice. This team followed most of XP’s principles and techniques. They claimed to have been practicing agile working before the organisational adoption and had used a number of workarounds in order to comply with incompatible but established processes in the wider organisation. For example, it was reported that long and detailed design documents were written in retrospect to fit the system rather than because they had any value.

A key practice is continuous customer feedback, mostly through a wiki and fortnightly telephone meetings. The co-located team used a ‘wall’ where user story cards and charts were presented, and a wiki recorded their progress, including current user stories and related acceptance tests. This was especially useful for other project members who were working remotely, e.g. the testers who were based offshore.

From the interviews and observations conducted, it was not evident that this team has been directly influenced by any of the workshops or documents prepared by the advocates. For instance, they confirmed being aware of the agile manual and sharing most of what it prescribes, but they had not fully read it or used it as a guide. This team was awarded an agile prize within the organisation, but they have not applied agile techniques beyond their role as programmers and software engineers.

Summary. Most elements of this group’s TF led to a definition and practice of their development methods very close to the agile manifesto. They have used this to differentiate themselves from the rest of the organisation and have in the past used workarounds in order to comply with an incompatible sociotechnical network.

5.3. Project Z

Project Z team is a bigger and more complex team than the agile team presented above. Project Z is made up of different stakeholders located in different areas of the organisation. In addition, most of the development work has been done by an outsourcing partner. In consequence, this project has many external dependencies.

The introduction of agile was received positively by Project Z in the early stages. At the user stories workshop the team were enthusiastic and could see various opportunities in using agile, although we also observed some conflicts between marketing and other groups. Six months later, we could not identify a consistent agile approach or influence in what they had produced. However, they still stood by their initial perceptions of what agile methods could offer them.

Elements of interpretation. Their recurrent element of interpretation in describing the main benefit of agile was that it would allow them to deliver solutions much faster than they normally do. This idea was shared by developers, delivery and usability managers, product managers and technical architects. Another element used especially by usability and user interface designers, was the opportunity to bring end users closer to the design and production process as well as giving the user experience group a more coherent role in the production cycle. The usability manager for Project Z expressed this by saying: *“The key is getting user experience people involved earlier, it’s not about getting requirements and handing them over the wall”*.

Despite these positive perceptions, we identified frustration because the team had not been able to adopt agile fully. One indication of this was the absence of user stories in the discourse, or in any physical or electronic representation. The staff did

not feel ‘touched’ by the organisation’s agile revolution, and there was a general feeling that “*decisions were made at the top but it is not coming down*” according to one delivery manager. He said: “*big executives say you do this but people on the ground do not understand what it is all about*”.

Another element of interpretation was the need for greater collaboration and communication across all stakeholders and the problems associated with it, especially between marketing managers and IT delivery managers. The IT delivery manager characterized the differences by saying: “*I (marketing says) want that box and I want that now, whereas we (IT delivery) unpack the box*”. The technical architect agreed that all communities need to engage earlier in the process so that decisions make sense from a customer, business and technical point of view.

Elements of practice. Some of the practices shaping agile adoption reflect the interpretative elements discussed above, the most obvious being the need for increased collaboration and communication across all stakeholders, including customers. However the organisation structure was hierarchical and the process of user input was constrained once the product requirements were identified.

There was some evidence of behaviours such as stand up meetings and user story workshops, and we identified several workarounds to integrate agile into the current way of working. One was the ‘hothouse’ a kind of workshop that brings together all the key stakeholders to build and refine prototypes and to agree on the next 90-day delivery. Extracting user stories from existing, very detailed ‘marketing requirements documents’ (MRDs) was another workaround. These MRDs were a prominent artifact found across the organisation. Leaders of Project Z claimed that it was very difficult to work with such detailed documents in a project whose scope could change rapidly; one agile developer described MRDs as “*not based in reality at all*”.

“*Engrained processes*” arising from existing practices were mentioned by most members of the project team. According to the delivery manager, these address contracts and integration with larger systems which are issues when adopting agile. To maintain appropriate communication with geographically distributed team members, wikis and a culture of phone meetings were encouraged.

A practice identified by technical architects, delivery managers and usability managers was that staff were trying to deliver in 90-day cycles, which meant that they had only ‘shrunk’ the Waterfall process without any qualitative change.

Summary. A less refined understanding of agile, and a number of engrained processes that hinder adopting agile are evident in Project Z’s TF. However, we also found a positive perception of agile and efforts to integrate agile into what they do that respond to this basic understanding.

5.4. The ‘business’ (or customer proxy)

We did not have the opportunity to interview and visit the premises of the ‘business’ companies within the organisation. However, they played a major role in the first user stories workshop, our interviewees made reference to them, and we had the opportunity to meet representatives of this group informally, which helped us to confirm the validity of other accounts that we gathered. Although we have less data from this group, we consider them here as they represent an important reference point in trying to describe and understand agile adoption.

Elements of interpretation. The main interpretation of agile in this group is that they did not see any value in creating user stories. From their perspective, the MRD

already reflected their work on user research and did not need to be repeated. However, there was no discussion or comment on the value of continuous user or customer feedback during the production process from this group.

Elements of practice. Marketing have historically been physically separated and distant from the IT division. This affects the amount and quality of collaboration between the two groups.

Summary. Overall, marketing's perception of agile is very basic. A higher interaction with other groups in the organisation, especially advocates and mature agile teams may have an impact on the elements of interpretation of their TF about product development processes.

6. Discussion

Table 1 shows that the TFs of the four groups we have studied are quite different, but there are also similarities. Advocates and the agile team have a clear agile frame as part of their described production methods whereas Project Z shows an initial transition from their *ad hoc* methods towards agile. In the case of the business's TF, we could not find any strong indication of agile integration.

Three of the groups saw agile as having value for them, while 'the business' apparently do not see the value of agile at all. One of the challenges faced by this organisation is how to extend an agile way of thinking beyond the developers, and both the Agile Advocates and Project Z believed that agile should cover the entire process, while the development team were content with focusing on implementation only. This shows a tension in the process of sociotechnical change: trying to translate principles created for the development of software into broader knowledge and processes to an audience with different roles, understandings and expectations, sharing a contrasting TF. One thing (the only thing) which all groups agreed upon was that increased collaboration would result in a better product. There is more variability evident in the elements of practice for each group, which is a consequence of each working to adapt to their own circumstances. As might be expected, the problem locus constructions for the first two groups identify problems in existing practices, while Project Z is unsure how to proceed and 'the business' blame agile itself. Agile advocates, the agile team and Project Z, agreed that the biggest cause of resistance to adopting the new methods lay in the need for cultural change in middle management.

According to Bijker, TFs show power dynamics in the constitution of technology. Powerful members of a social group try to frame other members with their own meanings and prescribed uses for a technology. For example, Advocates are trying to bring staff into their TF by rewarding mechanisms and faster delivery targets.

7. Conclusions

The Technological Frames developed here provide a snapshot of how agile was being interpreted and adopted in one organisation at the time of the research. They have identified some clear issues faced by the organisation and have highlighted areas of confusion and uncertainty. The analysis reinforces others' findings regarding the adoption of agile processes within a large organisation. In particular, the importance of ensuring that all stakeholder groups are consulted and engaged in the adoption process, and that existing practices need to be understood and taken into account in devising new procedures. A key issue faced by individuals and groups appears to be

coming to terms with what adopting agile means to everyday processes: What do I do when I get up in the morning? But also, what does it mean for the whole business to adopt Agile?

The TF framework has provided a novel way to analyse the issues of integrating agile into an organisation. The TF elements presented here emerged from the data and hence are specific for one organisation, but they provide initial indications of where others may find areas of conflict.

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