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by

Submission date: 19-Oct-2018 08:26AM (UTC+0700)

Submission ID: 1022680265

File name: Artikel-8-its.pdf (58.23K)

Word count: 3264

Character count: 18141

ACTOR NETWORK THEORY APPROACH IN THE REQUIREMENTS MANAGEMENT PROCESS

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ABSTRACT

Requirements management (RM) is defined as a set of activities to gather requirements, prioritized requirements (triage), and documenting requirements. The requirements would be a product of compromise between marketing (representing users), developers who build the software, and finance department who make the budget. In this paper we would like to show how to understand RM process in less than ideal world. Requirements are not a product of compromise. Requirements are product of power struggle between those 3 parties. The three parties would try to win the struggle and imposing their own agenda (including requirements) into the final products. We argue that Actor Network Theory could explain such phenomena better.

Keywords: Actor Network Theory, Requirements Management, Triage, Power Struggle

1 INTRODUCTION

Requirements management (RM) is defined as a set of activities to gather requirements, prioritized requirements (triage), and documenting requirements [1]. RM need to take into account various views, needs, and wants of different stakeholders of the systems [2-4]. In reality, the process of RM could be seen as power struggle between various stakeholders to have their requirements recognized, acknowledged, selected and then materialized into working systems or software. The ultimate goal of RM is to deliver product which satisfy most stakeholders' requirements within reasonable time and budget [1].

This paper tries to explain that RM is a network building exercise using Actor Network Theory (ANT) lens. We will used the process of RM using the triage model [1]. On the following sections we will discuss briefly triage and also ANT. Afterward, the discussion will cover how

ANT applied to RM and followed by conclusions and possible future works.

2 REQUIREMENTS MANAGEMENT AND ANT

2.1 Requirements Management

RM is a set of activities that consists of requirements elicitation, triage, and specifications [1, 5]. In these processes, requirements from various stakeholders are gathered (elicitation), selected (triage), and then documented to be included in the upcoming systems or software release (specification). The RM process's outcome ideally could satisfy most of the requirements in reasonable time and budget.

Requirements elicitation gather the requirements from either previous release's unsatisfied requirements, customer feedback, new development, bugs report, etc [1, 5-7]. Requirements prioritization (triage) is a process to select the appropriate set of requirements to be included into the next release [1, 2, 8]. In this process three different "force" are imposing their will, which are the voice of users (usually represented by marketing), the voice of developer, and the voice of finance department [1, 9, 10]. Marketing is concern with satisfying user's requirements as much as possible and as soon as possible. There are small windows of opportunity to release software before the competitors do. Developers concern with the ability to translate the requirements into working products. The more, more technically complex, and more challenging requirements will need more time and money to build. Finance's concern is regarding the available budget to build a product. Ideally the selected requirements should satisfy the customer within reasonable budget and time [1, 3]. Requirements specification is documenting the selected requirements to be included into the next release.

The best way of resolving the gap is to have a compromise [1, 10]. For example, marketing

might be willing to 'sacrifice' some requirements in exchange of faster release date. Developers might want to work on some difficult and complex requirements if they could get additional resources. Furthermore, additional budget and time might be granted if the software released with more "killer" and unique features that needed by users/customers and could not be delivered by competitors on time. The price might be little bit higher that result in higher income. Those are "ideal" solutions.

In reality the three different forces who determine the selection of requirements do not always have the ideal result. Each force would impose their view on what constitute the selected requirements. This is a power struggle [9, 11]. We argue that the power struggle could be best described using theories such as ANT to explain the power struggle. We believe such understanding would help managing the process. We will discuss ANT in the next section.

2.2 ANT

ANT is often accredited as the work of Michel Callon, Bruno Latour, and John Law [12-20]. ANT deals with [16, 21, 22]:

"... progressive constitution of a network in which both human and non-human actors assume identities according to prevailing strategies of interaction. Actors' identities and qualities are defined during negotiations between representatives of human and non-human actors. The most important of these negotiations is 'translation', a multi faced interaction in which actors: construct common definitions and meanings, define representatives, co-opt each other in the pursuit of individual and collective objectives."

The translation process consist of four stages [12]:

1. **Problematisation.** Key actors attempt to define the problem and roles of other actors to fit the proposed solution, which was made by the key actors. Key actors proposed solutions to the problems [23]. The key actors persuade the other actors that they all have the same interest and the answer to the problems is in the solutions proposed by key actors [19, 24]. The desired result would be the other actors would accept a set of specific conventions, rules, assumptions, and ways of operating defined by heterogeneous engineers which ultimately resulted in the formation of network [14, 15].
2. **Interresment.** Processes that attempt to impose the identities and roles defined in

problematisation on other actors. The key actors and other actors enrolled in the new created network try to lock other non enrolling actors. They gradually dissolve the existing networks and replacing them with new networks created by the enrolling actors [19, 20]. The enrolling actors try to stabilise the new identities for the other actors.

3. **Enrolment.** A process where one set of actors (key actors) imposes their will on others. The other actors will be persuaded to follow the identities and roles defined by the key actors. This will then lead to the establishment of a stable network of alliances. The enrolment process includes among other things coercion, seduction, and voluntary participation [25].
4. **Mobilisation.** This is where the proposed solutions gain wider acceptance. The network would grow larger with the involvement of other parties that were not involved previously. This growth is due to the influence of actors.

When using ANT to investigate a process, a researcher would focus on issues such as network formation, human and non-human actors, alliance, and network build up [18, 19]. Stronger alliances would be likely to influence the decision to adopt or reject some ideas. In conclusion, ANT recognises that a selection process such as requirements management is initiated by individuals who build a network of individuals (in the form of an organisation) and nonhumans (machine, tools, etc.) to prioritise a set of requirements.

Some other examples are the works of McMaster [25, 26] and Tatnall ([19, 20]. In those studies, the process of translation was believed to be richer and deeper in that it acknowledged the intertwining and inseparability of technical and social issues.

From the ANT perspective, an actor would build a network of power to overcome other networks of power so he or she could win and impose their ideas [16, 22, 27]. At the end, the actors would use the network to achieve their own goals. In the context of requirements management, the ANT perspective could be used to show how different actors spread their desired requirements to be accepted by others through the development of a network [25, 26, 28]. When their requirements are accepted by the other stakeholders (the development of a network), the actor could use the network to achieve his or her own goals. Non human actors could be 'act' in different way than intended or imposed by the key actors. Latour [15, 27] has shown how the Aramis failed to perform so it caused the abandonment of mass rapid transit project in Paris or how bacteria have been

conquered by Pasteurization so it caused the jettison of Louis Pasteur into scientific stardom to show the role of non human actors.

3 DISCUSSION

RM process is power struggle to impose one side's preferred requirements into final product [9, 14]. Actor Network Theory (ANT) provides a view where RM is a social process. A process where key actors try to impose their view on the problems and their version of the solutions to other actors by building a network of human and non human actors (in this case could be customers, technical barriers, software, etc). The network was in form of requirements.

Actor Network Theory also looks at the success and failure of such endeavor. The network formation will be success if the key actors could entice other actors either human or non human to join their new network. By forming new networks (requirements), the alliance dissolves the old network (the other requirements or constraints). Non human actors need to perform their intended duties, otherwise the new network will crumble and failed to form. Some might say that the human actors responsible for making non human actors to perform yet we could see from time to time that for some reason a computer and its applications simply does not work. The fact was the requirements failed to be built and the network failed to gain wider acceptance.

For a start, eliciting requirements from user or customers would involve the marketing department (typically) build a network of "strong and influential" customers to advocate and impose a set of requirements [9]. The requirements from customers along with the analysis of competitors would be use to dictate the release of next version [1, 29]. The marketing department builds a network of customers and also competitors (indirectly) to influence the release of next version. This network would try to impose features and release date of the final product. There are two main arguments. First, marketing department may argue that unless the requirements being satisfied the user would move to competitor's product. Second, marketing department may argue that releasing product after the competitor would decrease market share. Customers already bought competitor's product even when they were more inferior simply because it was available at the time of need.

On the other hand, during the negotiation or triage, the technical department (developers) would try to impose technical barriers. The demand of requirements and release date from marketing

departments usually could be deemed as conflicting. The requirements are as many as possible and the release date is as soon as possible [30]. Developers would build a different network to answer these by enrolling the help of non human actor. The non human actor in this case is the software itself. More requirements (number and complexity) always need more time to build [1, 5]. Therefore the developers have reasons to ask more times to satisfy all the requirements or reject some requirements within the time limit given.

Outside those networks exists another network namely finance department [1, 31]. The finance department concern with the budget required to build the product. It also concern with the potential revenue from sales. Additional budget would affect the selling price which may decrease sales. Late release of product (after the competitor) would also decrease sales. On the other hand on budget and on time could end up with product that unable to satisfy customers and also decrease sales. The dilemma would be the main concern of finance department. Both "demand" from developers and marketing could result in late delay, lack of features, additional time and budget, or any combination of three.

Now, the problem is which side should be satisfied? In ideal world obviously there should be some compromise. Few has suggested some method to resolve the conflict such as just enough requirements management [1], Theory W Methods [10], negotiation [29], etc. The compromise would require each party to sacrifice some of their demand (requirements, time, budget, etc) in order to satisfy users' requirements within reasonable budget and time. However, as we argue, it is not always possible to achieve ideal compromise.

ANT suggested that in the struggle of power, one party who could build strong network could dissolve other networks [14, 31, 32]. Therefore, the winning actor and his or her network could impose their view of what constitute as must build requirements.

If the marketing department have their way, the requirements would be as many as possible within their time limit. The time limit may not be possible for the developers to build the requirements. The power of marketing department may strongly persuade finance department to add budget for hiring more developers. This step might be risky as pointed by Brooks [33], adding personnel did not necessarily make a project finish faster.

If the developers have their way, they may choose to build only requirements that convenient for them. This might end up as product with late

release date or lack of feature. Both could have devastating impact toward the product and the company.

If the finance department has their way they would impose a tight budget. This could mean the developers would only have limited resources to satisfy requirements. It would also harm the product in the market.

Inevitably, the scenario describe above might happen in real world. Many anecdotal evidence and rumors surrounding a software release could be the evidence of the existence of such scenario. There was software released without some previously promised features, late release, problems with drivers due to incomplete compatibility testing, unresolved bugs or unpatched vulnerabilities, etc.

4 CONCLUSION

RM process is power struggle to impose one side's preferred requirements into final product [9, 14]. There are possibilities that from the ANT perspective, an actor would build a network of power to overcome other networks of power so he or she could win and impose their ideas [16, 22, 27]. At the end, the actors would use the network to achieve their own goals. In this context, the actors would impose their preferred requirements to be built into the released products. There are ideal solutions to the problems of prioritizing requirements, yet it is not an ideal world. We have illustrated some possibilities that one side might impose their requirements and "win".

Our illustration has used a commercial software scenario with three different stakeholders involved. ANT might be applied to explain the context of in house development. The stakeholder might be different and the motives definitely different. Sales and income might not be taken into consideration but others consideration might be more important. We are currently exploring this scenario for our research project. We plant to illustrate further with case studies when we have sufficient data.

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