

Risks and Dependable Deployment

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ABSTRACT

This paper reports on some of the work produced on the DIRC Targeted Activity 'Dependable Deployment'. It particularly focuses on the issue of *risks* that arise during the development and deployment stages of systems design. Risks inevitably plague complex systems design projects and since few projects can be stopped and begun again professionals often try to avoid them or solve their emergent problems through sharing knowledge gained from personal experiences - 'war stories' - with other practitioners. We report on our development of a web site to list war stories - descriptions of risks and subsequent actions - arising from specific healthcare information systems development projects. This is intended as a resource to enable developers in this domain to learn from the problems and experiences of other projects.

Keywords

Risk, Dependability, Deployment, War Stories, Hazards, Healthcare Information Systems, Ethnography

1. INTRODUCTION

When seasoned practitioners are asked how to design better, more dependable computer systems, on time, and without problems in deployment, the answer is often twofold – after the first attempt throw it away and begin again, and do so with the same project team [e.g. Brooks, 1]. The idea is a straightforward one, in most design projects numerous decisions are made that later turn out to be 'non-optimal', erroneous or mistaken. In the fullness of time developers realize that if they had known what they do now they would have done things differently. When considering organizational systems (large scale, complex, having a definite impact on organizational practices and operation) the process of design is also a process of learning about the different parts and practices of the organization and learning about the impacts of a design on those parts and practices. This means that unfortunately the required and desired knowledge of the organization is often only achieved at the end of a project.

Unfortunately, when considering the development of complex and/or large scale systems the possibilities of throwing the initial system away and starting again are often slim. Furthermore, project teams rarely stay together in entirety over the course of a single project, never mind across the development of two or more projects. In the NHS if projects are shelved, the subsequent system is likely to be built by another project team, from a different private company, configuring their own customizable-off-the-shelf (COTS) solution. Much of the learning of a previous project - in terms of documentation and expertise - is likely to be lost or out of

date, as in this domain the technology, its envisaged role, and the working practices and procedures of the organizations change rapidly.

Of course, organizations do learn through their own experiences, however, timeliness can be an issue. The question of how much of what is learnt in hindsight can be put to good use in the future is an open one. However, since there is no 'silver bullet' of a design method or process – there may be better ways of doing things on a particular project, a more suitable COTS system to buy, more expert designers and programmers to employ, etc., but still no sure fire route to success – previously acquired knowledge and experience will necessarily play an integral part in design and development. Based on this idea we wanted to build a website for developers of healthcare systems to effectively share their expertise and experiences to help avoid some of the pitfalls of previous projects and to share their knowledge of development problems and possible solutions.

2. EMPLOYING 'STORIES' IN DESIGN

Organizations have attempted to archive knowledge and experience through *knowledge management* initiatives that seek to capture-codify-and store knowledge electronically. However, these formal (or 'hard') programs have often met with only partial success. For example, personnel often begrudge the extra work required to populate 'knowledge' databases, may resist making their specialist knowledge publicly available to their company – so undermining their own expert position, and successfully searching for, retrieving and re-contextualizing the 'knowledge' is notoriously problematic (e.g. [5]).

Other branches of research, and the lack of success of formal approaches to knowledge management has lead researchers to focus on the informal, mundane ways in which knowledge, experience and expertise are employed, shared and passed on between personnel within and between different organizations. Numerous studies have now drawn attention to the role of narrative, or stories, in communicating just this type of information. A seminal work in this area is Orr's [6] study of photocopier technicians. He describes how the technicians form a *community of practice* whereby they routinely tell 'war stories' to one another as a means of sharing their experiences. As well as being stories in which, for example, the narrators demonstrate their own 'heroism' or ingenuity', it is through these means that knowledge of problems and solutions is most successfully shared and transferred. That this is the case is shown by the fact that the company achieved more efficient and effective work by the technicians not by designing a better problem and solution database or better manuals but by supplying the technicians with mobile phones so they could

talk to each other about the problems as they encountered them.

Currently, there is great interest in the role that stories can play in organizational activities – not only for problem solving but also for many other knowledge management activities and even as means for inspiration, leadership and strategic thinking. Much has been written and it is now espoused by a number of well known academics and management gurus [e.g. 3,4]. The basic idea is that stories are a ‘natural’ way for humans to communicate ideas, knowledge, experience and so forth, they are necessarily social, they help us bond with other people and they contain the necessary contextual details that are lost when we abstract and codify information. Also, they are part of a *dialogue*, so the teller can be queried for more information, elaboration, re-specification and so forth, so mutual understanding is more easily achieved. The idea is simple; to increase the transfer of knowledge, increase the opportunities to share stories.

The view of Larry Prusak (IBM’s head of knowledge management) and his co-author, David Cohen [2], is that as an organizational strategy, companies should encourage many forms of social interaction between members of staff, as this increases storytelling and all that goes with it, which in turn increases what is termed the *social capital* of the organization. Social capital - shared values, trust, community, etc. - is said to be crucial to successful organizational functioning.

3. A RESOURCE OF DEPLOYMENT RISKS, HAZARDS AND WAR STORIES

Over the last few years we have conducted a number of ethnographic studies of systems design and development in healthcare settings. During this time we have seen and documented a number of the difficulties these projects have experienced. While not being in a position to seek to take measures to increase storytelling per se in these organizations (and not having the management skills, nor necessarily the desire) we considered that it might be useful to provide a resource through which the experiences of the project teams might be archived as a resource of ‘risks’ or ‘hazards’ of deployment. Following on from the above cited research on war stories, storytelling and knowledge management we decided that a resource that detailed the risks in a narrative format, which could be used interactively by professionals and practitioners themselves, might be a useful approach to take.

We discounted the idea that we should just design a bare ‘template’ website whereby practitioners could add their war stories and their contact details (if they wished). We believed that we might stand more chance of attracting postings and recruiting interest if we pre-populated the site with ‘war stories’ organized in some form of structure that might better allow practitioners to browse for and locate entries that might be useful to them. With so little to differentiate many sites on the Internet, designing to attempt to get a critical mass of users is crucial. Since we had a wealth of ethnographic material from observing and recording project work and interviews with personnel we decided to firstly mine this for risks, hazards and war stories to initially populate the site. In a sense, at this stage we were producing war stories by proxy, where as in the future we would like the war stories to mainly come from the practitioners themselves. These narratives about problems could be posted directly to the website by practitioners. Also, as another source, an ethnographer could explicitly elicit war

stories via interviews or collect them from observations of where they spontaneously occur in interactions between personnel in a setting.

In the following section, to illustrate how we derived our ‘proxy’ war stories from ethnographic fieldwork we will discuss some examples of issue and risk handling, from a study of healthcare information system design at a hospital Trust in the North of England.

4. ‘ISSUES’ AND ‘RISKS’ HANDLING AT NORTH OF ENGLAND TRUST

The Trust in this study is currently in Phase 1 of a three phase comprehensive £8 million electronic patient records (EPR) project, delivered as a public private partnership (PPP) in which analysts from the Trust work cooperatively with analysts from the system provider (a US based company (USCo)) to configure their product for use in the hospital. Phase 1 was due to ‘go-live’ in February 2004 and consists of the core administrative system and connected reporting system, A & E, theatres, order communications, and pathology systems. The core administrative/reporting system incorporates various clinical applications and is designed to be integrated with existing legacy systems, most notably a series of pathology applications. Phase 2 involves documenting care (medical records), and GP access, and Phase 3 is concerned with clinical pathways and electronic drug prescription. As is clear this project has now experienced serious slippage and but should now ‘go-live’ in February 2005. Unfortunately for the project this makes this an apt case to derive war stories on risks and hazards in deployment.

As is common on many systems design projects a key concern during development and deployment is to identify risks and potential risks to the project as soon as possible and consequently have the apparatus in place to deal with these problems. To manage risks the project team operates two ‘logs’ – an ‘issues log’ and a ‘risks log’. When a member of the team (usually at weekly meetings) raises something (this can be on a very wide range of topics that are related in some way to the design) as an issue or problem it is added to the issues log. If an issue is deemed serious enough to threaten the timely delivery of project it is deemed a risk. The logs are managed such that issues can become risks and vice versa and that if items persist, increase in magnitude or decrease in importance they can be moved up or down the logs as illustrated in the following quote from a project team meeting:

...its already on the Risk, Log we uhm probably up the risk number at this stage cos its obviously increased in possibility or likelihood”

The decision as to what place in what log was usually taken cooperatively by the project team but the project manager usually makes the final decision. The logs also serve as an apparatus for taking problems to a higher level to be dealt with thus keeping the paired US and Trust analysts from arguments that might harm their working relationships. These features are illustrated in this quote from the Trust’s project manager:

“I have said I wanted the data to be issues at the risk log now because I I said this delay and um the direction so so um not not that I want anyone to get into an argument with them during the conference call but just so you do know I have escalated this one because I am very concerned”

The quote also references a risk that the Trust team identified – ‘the data’ – which in this case was referring to the fact that the Trust’s analysts were unsure of the data sets that they were meant to be collecting for the purposes of the database build. They felt that they should be getting more direction from their US based counterparts. However, this had led to disputes over whose responsibility this was. This can be thought of as risk related to the technical design of the system – i.e. what a data set should consist of – but it is also clearly a risk related to contracts, roles and unclear or disputed responsibilities.

Risks, as managed explicitly, come in many forms though, as shown in the following quote:

“Put this in as a very big risk, if the word gets out that the new system is responsible for more work we could be in big trouble”.

This risk is to do with the notion that the project could be in serious trouble if the Trust staff believe the system will cause them more work.

Irrespective of the explicit handling of ‘issues’ and ‘risks’ using the logs, talk of risks in general is high on the agenda in a project like this where there are reputations, money, jobs and even the future of the Trust on the line. For instance, as shown in the example below, a senior clinician shows their concerns with the fact that the Trust is implementing a system prior to and separate from the current national program. They are worried that the Trust will separate itself from the NHS, although in this case they are placated by a technician:

Clinician – *“Do we risk getting an isolated, different system that is outside the national system?”*

Senior Technician – *“The system will be held together by HL7 and XML and the minimum data set, so its all compliant, but with different interfaces etc. but there will be different systems in different places.”*

And another major risk is that if the new system does not enable them to produce the ‘right’ figures they may be negatively evaluated and this may threaten their status and funding:

“because the reports we hand into the NHS are crucial to our funding, as a as a Trust and obviously we have to get the reporting right and and eh there’s a huge risk um to the Trust because we’re going live six weeks before the end of year, and um so hoho all of our end of year reports we have to make sure are right between hahah that six week period, so o-obviously again there’s just a huge risk to the Trust as a whole”

As shown in the examples above the project team has an on-going concern for risks and potential risks. The flagging up of potential problems and the use of the logs serve several purposes, for example, as a means of identifying concerns before they become serious, as a means of keeping track of multiple issues, as a means of prioritising problems, to provide a record of issues and as a means of escalating problems to be dealt with at a more senior level. When deriving our ‘proxy war stories’ from the ethnographic material we focused on risks that did actually become more serious problems, i.e. did delay or disrupt the project. For example, one of the risks we identified (referenced in quote discussed earlier) concerned the problem of deciding what the data sets should be and who should and how should they collect the information. Other example risks identified, concerned problems of working with paired analysts in

different countries, difficulties in balancing requirements for the purposes of integration, and the lack of understanding of how much work was required to configure the COTS system to fit with the Trust’s requirements. In the next section we provide a description of the how we designed and built the website, discussing its structure and providing some examples of its content to expand on the previous discussion of risks derived from ethnographic fieldwork.

5. RISKS AND HAZARDS WEBSITE

The narratives that we have used as proxy war stories are taken from situations during the deployment of healthcare systems where either a problem has arisen, or something hasn’t adhered to the deployment plan or where something else has interfered with the smooth deployment of the system.

In order to develop a web site [7] that would be a resource for all of the parties involved in the deployment process, we first had to decide upon a design that would be suitable for both designers and project managers. Part of the design process was to look at what information relating to the war stories would be useful. Obviously a description of the war story would be an essential piece of information but in addition to the war story an anecdotal description of what happened at the time to rectify the situation, or of what was learned when looking back, would be of use to those using the database. It is explained on the web site that the anecdote of the solution, which was used at the time the war story occurred is not necessarily a suggested solution but simply there as an example of what happened. One issue that we have to look at is the issue of confidentiality within the healthcare sector, in order for this to become a growing resource we felt it necessary to allow anonymity (if desired) for the war story authors as well as the war stories themselves.

Here is an example of a war story who’s solution is a useful anecdote of what was learned after the event happened.:

“Name: Lack of Code of Connections.

War Story: In Public Private Partnerships (PPP’s) to design and deploy EPR systems the private supplier requires code of connections approval in order to enable access to the NHS network, through which the networks of individual hospitals can be gained. This technical security clearance is necessary for off-site access to the Trusts’ networks and systems. In the case at Preston, code of connections approval was overlooked during initial project planning and preparation. With the private supplier being US based, and build going on simultaneously at two sites the lack of code of connections during the first six or so months of database build and configuration, work was hampered by the inability of paired US and UK analysts to share real-time up to date details of the system. Misunderstandings about the ‘current’ configuration of the database delayed the project.

Solution: This problem clearly stemmed from a lack of initial understanding about what a PPP for designing an EPR would entail concerning access to the network infrastructure, and the requirements for off to on-site collaboration. Code of connections should be approved early on in the project.”

Once the proxy war stories had been identified we explored different ways of grouping / arranging the stories to allow straight forward access but which still allowed the diverse range of war stories to be handled by the web site. There are

two ways in which the war stories have been grouped, the first is by its stage of deployment and the second is by its type:

Stages of deployment were as follows: Procurement, Award and Signing of Contract, Data Collection, Database Build and Configuration, Integration, Testing, Transition Management, Domestication and Evolution and Maintenance. The stage of deployment represents the stage of deployment during which the war story (i.e. problem) occurred. It was also thought that it would be necessary to include a category that represented the stage of deployment during which it was thought necessary to be aware of the war story. For example, although the 'lack of code of connections' war story occurs in database build and configuration, it would be pertinent to know that the situation might arise during the procurement stage of deployment. Having applied this to the other proxy war stories that were selected it became clear that *ideally* it would be good to know about all of the war stories as soon as early as possible – i.e. during the procurement stage. This too is explained on the web site and so there is an exhaustive list of all of the war stories in the procurement stage along with links to the stage during which they actually occur. By grouping the war stories in this way any person who is either embarking on a project or at a certain stage of deployment may browse the war stories relating to that particular stage.

The second way in which we grouped the war stories is by keyword 'types', the list of types consists of: Access, Bespoke or Off the Peg, Communication, Configuration, Incomplete Data Sets, Integration, Local Verses Global, Outside Commitments, Participation, Relationships, Schedules, Security, Suppliers, Support and Training. By grouping the war stories in this way allows the user to access them by type, e.g. if a manager is considering a bespoke or off the peg solution, they could take a look at all of the war stories that apply to that category. This is an advantage because war stories in the same type, may appear in several different stages of deployment and therefore be hard to find.

The web site has been built using MySQL to store the war stories and the web pages are written using Php (a server sided scripting language). The advantage of using MySQL and Php together is that Php allows simple, direct access to the databases so that they can be populated directly through the web site. All of the individual pages for the stages of deployment and for the types of war story are generated automatically so there is potential for more types to be added or to change the stages of deployment that are currently there (see further work section).

Although the web site is primarily aimed at the designers of such systems, it is hoped that it will be used by all of the stakeholders involved, e.g. project managers, funding committees, designers, and the eventual users of the system themselves. In order to do this the site has been designed to be simple and generic. The two different ways of accessing the war stories, along with a description of our intentions for the site, and instructions for those who are unsure about how to use it all help to make it open to a wider audience. As well as reading the war stories that are held in the web site, it is hoped and expected that Managers (indeed any stakeholders) also contribute with their own war stories. To this end the final section of the web site has been designed to allow users to enter war stories through a submission page. The submission page asks for the war stories to be entered in the same format as the existing ones and provides a form, which is split up into a number of sections. The first section is for the name of the war

story and the next two sections have the lists of the stages of deployment and keyword types so that the user may indicate where the war story occurred, and the types of war story of which it might be similar to. The final sections of the form are the entry of the war story itself and the 'solution' or actions taken at the time [8].

6. CONCLUSIONS AND FUTURE WORK

The website is currently at an early stage of release. At the moment it is being evaluated by several Healthcare professionals for it's relevance to the projects on which they are working at the moment. The next stage will be to assess their findings, take on board any suggested improvements, and refine the site. There are some additions to the web site that are being considered at the moment, the first is the capability to add new categories to the 'types' of war stories. This would be an advantage as other types of problem are likely to arise. We are also considering opening up the website for design project work in general.

Another direction in which we'd like to take the web site is to create an interface for the management of the databases. This would consist of a password-protected section of the web site where an administrator could view and edit all of the war stories without having to have any knowledge of Php or MySQL. This would be an advantage if there were errors in the war stories or, if for example, something which has previously been acceptable now had to be anonymised.

The final stage of testing would be to allow the web site to be used during a new project deployment and at the same time allow other healthcare professionals to add their own war stories to the collection.

Another issue concerns the war stories themselves. To a certain degree our initial population of the database with proxy war stories was not ideal, as we were translating information we gathered on problems into 'war stories'. In the future we would like to either gather specifically elicited war stories from the practitioners themselves through interviews or would like them to produce them themselves. However, there are also some more interesting issues to research regarding war stories, particularly regarding naturally occurring (rather than elicited) stories such as; (1) how do war stories function in action, (2) how do they relate to other project work activities, and (3) what are the different types and formats of war stories? For example it would be interesting to see if there are different formats to different types of war story (e.g. stories of success or failure). Furthermore, it would be interesting to examine the circumstances in which they are naturally provoked in a workplace, and also how people decide if a story is appropriate to their current situation and in what ways they can inform decision making. Overall, we think it would be useful to investigate war stories as occasioned components of practical reasoning and action in the workplace, and we intend to pursue this line of inquiry.

In conclusion, we believe that the website, as a resource that healthcare design allows professionals to share knowledge and experiences through war stories could prove useful for them and may help them in their community building. This could be very important in the next few years as all across the NHS similar projects – Public Private Partnerships (PPPs) to implement COTS electronic patient record systems – are taking place. Designing in these complex settings is inevitably

difficult and so it is crucially important that professionals share their knowledge of problems so as to help this process run more smoothly. We would like our website to contribute in a small way.

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