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Developing General Practice Information Systems to Support 'GOOD' Consultations Using the DSDM AternFramework

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Abstract:

It has been demonstrated recently that, the computer plays a significant role in the consultation process in doctor's room, it is considered as a third actor. Doctors use the computer system to record information about their patients to help them in consultation process. This computerised prescribing reduces errors, agile safety and saves time in re-description of the patient's case. Currently, more practices use various types of computer systems which have been already developed to match the needs of general practitioners and health service managers. Moreover, the development of the clinical systems

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helps the doctors in diagnosis with more accuracy in the consulting rooms, and that development has many aims: Health monitoring, disease management, examinations, test results review etc. These systems may enhance the medical care quality. In addition, a good consultation meets the concerns and expectations of the patient. The Dynamic System Development Method (DSDM) is an agile delivery framework for management and delivery of IT- and non-IT-related projects. It focuses on strategic goals and incremental delivery of real business benefits; at the same time it is maintaining control of cost, risk, and quality.

In this paper, Atern DSDM will be used for clinical system development by using development tools like ALFA (Activity Log Files Aggregation) Toolkit to measure the impact of various patients' records systems (EPR) features on the clinical consultation. It provides the best practice approach using collaborative working, demonstrable prototypes and regular evaluations. Three stages are applied to develop the ALFA Toolkit: observation, aggregation and analysis and Multichannel video which are used three or four to a single screen to identify the occurrence of different interactions and their duration. Ultimately, data were analyzed to get results.

Key words: Agile, Dynamic System Development Method(DSDM), Electronic patient record (EPR), Activity Log Files Aggregation (ALFA), Observational Data Capture (ODC), MoSCoW, General practice, video recording.

1. INTRODUCTION

Most of health care contacts in the United Kingdom offer a primary care. Information and communications technology have been used considerably in this field [1], where a huge number of patients need to be quickly and effectively treated. In doctors' rooms the computer plays a significant role in the consultation. It assists doctors in diagnosis and gives them the required information that meets their needs [2]. In Britain there are almost 90 percent of general practices use computers to carry

out clerical tasks and repeat prescribing during clinical sessions .The development of structured knowledge-based systems is being encouraged to improve the quality of medical care. These systems have been implemented to support the scientific publications and provide guidelines and protocols [3]. They could potentially improve the quality of decisions made in the primary care consultation. In spite of the professional experts in their field and their good thought, they are not adept in building social solutions and understanding the patient requirements. So, there is disparity between the way of required thinking to develop solutions and necessary thinking to develop strong technical solutions. However, a traditional "waterfall" approach has been preferred for clinical systems development, but it is not suitable for non-IT centric projects, and designers have failed to develop these systems to support good consultation. Therefore, there is a need to use agile principles to develop the clinical systems which have distinctive characteristics to ensure the project success with a good performance. In this context, Agile methods appeared as a reaction to traditional methods of software development. Dynamic System Development Method (DSDM) has emerged for Rapid development of technical application that aims to deliver the right solution-software aspects at the right time within fixed budgets[4]. In this paper Atern DSDM systems are proposed and implemented to develop interface and functionality between patients and doctors during consultation sessions by using development tools such as ALFA Toolkit FILE for assessment the clinical system taking into account doctors and patients needs [5].Three efficient video channels was used and have been monitor one screen to record the different reactions and duration of the patient during the clinical consultation process. And thus data were analyzed down to results. These systems need to develop for providing the highest acceptable for both clinical and patient.

2. OVERVIEW OF DSDM ATERNAPPROACH

Recently, most organisations have used Atern due to its principles which help in directing and putting the right frame for teams of project in order to make them capable to prioritise and deliver their project solutions on time. DSDM Atern is an agile framework for management and delivery of projects at the right time without any delay. The first version of DSDM appeared in 1994 and has developed to help the management of project [6]. Atern is the latest version of DSDM, it presents the right business solution before projects deadlines because the team of project and stakeholders stay focused on the business result. And it provides early returns on investment and reducing risk. It focuses on cooperation principle among people who related to the project. In addition, it handles and delivers on time according to the needs of businesses, and it does not compromise on quality. Atern offers the knowledge, experience and creativity of end users. It spends early time to examine the overall structure of the solution before constructing the project components and it has flexibility in the implementation of projects.

3. ATERN FRAMEWORK

Atern framework relies on its philosophy as the backbone of its success that philosophy based on all projects of business. It should be well organised and defined with structured objectives and it focuses on early delivery. To deliver the best possible solution and achieve real benefits to the business, key stakeholders should understand the objectives of the business, collaborate together and they must be ready to receive a fit for purpose solution. They must be ready accept that change and to understand more about the solution being developed. The stakeholders must be ready to deliver a fit for purpose solution.

In Atern DSDM, eight guiding principles must be applied in the project, if one of them is ignored, the whole bases of DSDM is endangered [6]. These principles represent culture, philosophy and method of working to enable projects to be delivered in the real time. Table 1 explains the eight Atern Principles.

Table1: Atern Principles

No.	Principles	Description
1.	Focus on the business need	- Atern teams will focus and understand the business requirements and understand the priorities of business.
2.	Deliver on time	- Products delivering process must be on right time. To achieve that, the Atern teams willtimebox the work and focus on business priorities.
3.	Collaborate	- Collaboration among team members and stakeholders is highly needed; helping them to understand fastly the business needs. To achieve that, Atern teams include the right stakeholders, at the right time within the period of the project so that team members are encouraged to make decision.
4.	Never compromise quality	- The level of quality which will be delivered should be accepted at beginning, it should remain fixed without any change. Also it should take into account used MoSCoW Prioritisation and Timeboxing to ensure a good testing without defaults.
5.	Develop Iteratively	-Atern uses developed iteratively throughout its lifecycle down level of Timeboxing to gain an accurate business solution.
6.	Build incrementally	- Atern focuses on incremental development to deliver real business benefit early.Atern focuses on understanding the scope of the business problem, and then looks for the suitable solution.
7.	Communicate continuously and clearly	- Atern focuses on continuous communication among project team members. - Atern techniques are designed especially to improve communication effectiveness for both teams and its members.
8.	Demonstrate control	- An Atern team must be active during the monitoring and controlling on the progress of business in line with Foundations of products stage.

4.COMPARISON BETWEEN TRADITIONAL AND ATERNAPPROACH

In the foundation stage of business projects, most projects have four parameters (time, cost, features and quality). These parameters should not to be fixed in the beginning in order not to fail the project and generate problems. The time and cost of the project management in the traditional approach are subject to change while the feature content of the solution is unchanged. In contrast, Atern framework (time, cost and

quality) are always fixed in the foundation phase while unexpected events may be occurred, and additional requirements lead to adjust the features that are to be delivered. This helps to produce strong foundations on which projects are to follow and with the help of timeboxing and the use of MoSCow.It can be well guaranteed that iterations are produced on time and on budget. Figure1shows the comparison between the Traditional Approach and AternApproach in project management [6].

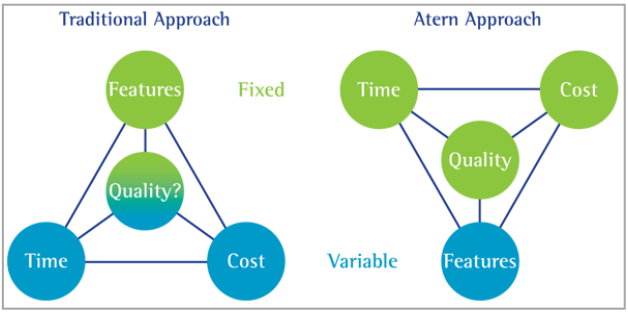


Fig.1: Comparison between the Traditional and Atern approach[6]

5. ATERN LIFECYCLE

Atern lifecycle integrates a project management lifecycle and a product development lifecycle into a single process. It provides a clear understanding of the project from the beginning to start building a solution iteratively and incrementally. The Atern lifecycle consists of seven stages as shown in table 2.

Table 2: Atern Lifecycle

No.	Stage	Objectives
1.	Pre-Project phase	- It identifies the work problem which should be handled. - It identifies a Business Sponsor and Business Visionary.
2.	Feasibility phase	- It estimates the proposed timescale of the project and costs for whole project. - It involves solution sourcing, the governance and organisation of the project. -It identifies and analyzes the project obstacles in order to have the strong control for any obstructions to the project at the feasibility.
3.	Foundation stage	- It identifies the high level of requirements for the project and determines the priority according to need of business.

		- It describes and manages risks and continuous obstacles in the project.
4.	Exploration stage	-It is iteratively and incrementally used to examine deeply business requirements and translate them into a practical solution.
5.	Engineering phase	- It is iteratively and incrementally employed to develop the preliminary solution created during exploration and also to achieve full operational readiness. - Development effort had been focused on addressing non-functional requirements such as: capacity, performance, supportability, maintainability and security.
6.	Deployment phase	-The product is ready to ship outside organisation creating it.
7.	Post-Project phase	- It reflects the performance of the project particularly in business value.

6. USING OF DSDM TO DEVELOP CLINICAL SYSTEMS

6.1 Electronic Patient Record (EPR) on the clinical consultation

Although UK general practice is universally computerised, there are a small number of established methods to compare the impact of various brands of computer systems on the consultation [7].Electronic Patient Record (EPR) Systems are applied in this field. Most of them are spread, but not based on development specifications to serve clinical consultation. The interfaces and functionalities can be used in different ways, which integrate the computer with consultation. Therefore, health systems began to provide the advanced systems to get an improved efficiency and patient safety through data sharing across the health system. However, implementing these modern systems gives a good chance to enhance the interface and functionality.

The beginning was with using a single channel video for measuring the impact of technology on the clinical consultation, but it is difficult to measure the precise length of interactions [8].Three video channels were recorded in the development stage for expanding angle view of the consultation with using optimise video recording tools with lowest cost, also an accurate time stamp to synchronize the videos. The new system should meet these objectives: the development process must be carried

out in consulting rooms in period not accesses an hour, the tools can be set up in most clinical settings in less than ten minutes, be reliable and easy to use by others, gives aim time stamps of performances within the consultation, and provide a good outcomes which could be used by software engineers of computer to upgrade best systems.

6.2 Approach for requirement identification

To start- up any project, there are essential objectives (purpose, requirements and scope) of the project should be known. Requirement is a service, feature or function that the user desires the solution to present or display. The system should meet both user requirements and business needs. These requirements should be flexible according to the business needs. The technique in Atern DSDM allows requirements to be prioritised according to user needs. These prioritise must be defined at a high level from the outset before the start of work reviews taken incessantly as work is in progress. Throughout the Project, each requirement should pass through four life-cycle stages: Elicitation, Analysis, validation and management.
This project based on dividing the work into packages. It will develop a method to display multichannel video of the consultation [9]. Recently, in healthcare the ALFA (Activity Log Files Aggregation) Toolkit is developed for observing the consultation Electronic Patient Record Systems (EPR) because the other methods had limitations in observing the interaction of the computer; they were not designed for using within the clinical sitting [5].The requirements of this project are:

1. Developing the clinical system by using Atern approach to support a good consultation in doctor's room.
2. To know the optimal number of video channels with lowest cost.

3. Using multi video channels which produce an overview of the process, screen capture, and the body from participants in process.
4. To find a trustworthy way to code the video to be easy to navigate in a particular activity.
5. Accurate automated time-stamping of computer use.
6. Automated capture of body language using pattern recognition software and other change.
7. To aggregate all the inputs into a single navigable analysis output.
8. To present the data in a good format that could be used easily by software engineers to enhance systems.

In addition, some hardware and software requirements should be available to achieve the development process such as suitable room, Hardware/software: video cameras, recording media, screen recorder software, video editing software and ObsWin or similar observational data analysis tool.

6.3 User involvement

Atern focuses on the principle of collective action for the success of any project. It focuses on how people can work together efficiently as a team, why responsibilities and roles are distributed to each person in a project team. This cooperation is helping to overcome any obstacle to the success of the project.

Stakeholders consider the key to success the business project. They are responsible for understanding the project objectives in projects lifecycles, for obtaining the best solutions and ideas for their projects. In this task, the team will work together to achieve project target; the users have distributed according to their roles [10]:

1. Clinician and patient to observe interaction between them within the consultation.
2. General practitioners at all stages of development.

3. Computer Software engineers as solution tester.
4. Software developers as solution developer: they could check the process models to assess the performance of design characteristics within a consultation.
5. Experienced educationalists and academics: to take their opinions about assessing video consultations.
6. Business Sponsor: manager of health care centre.
7. Business Visionary, Project Manager, Technical Coordinator, Business Analyst, Business Advisors, Workshop Facilitator, AND Atern Coach.

6.4 Using the ALFA Toolkit for developing the clinical system

There are three stages for developing the ALFA Toolkit: observation, aggregation and analysis.

6.4.1 Observation

a. Multi-channel video recording (MCV) and Observational Data Capture (ODC)

Multichannel video are used three or four to a single screen to identify the occurrence of different interactions and their duration. When the doctor clicks on a certain window, it will be enlarged to be full screen [11]. These videos are showed by academics accustomed to assess video to collection and analysis of observational data about doctor-patient and doctor-computer interactions. Inside doctor's room e.g. the doctor talking to the patient and looking at the screen, making eye contact and prescribing. Figure 2 shows the multichannel video output.

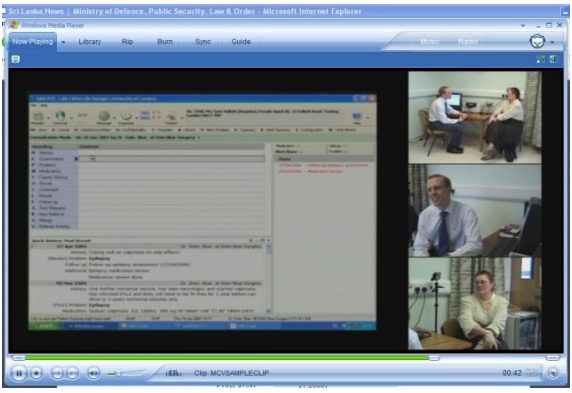


Fig.2: The multichannel video output[12]

b. Capturing and Coding Consultation Activity

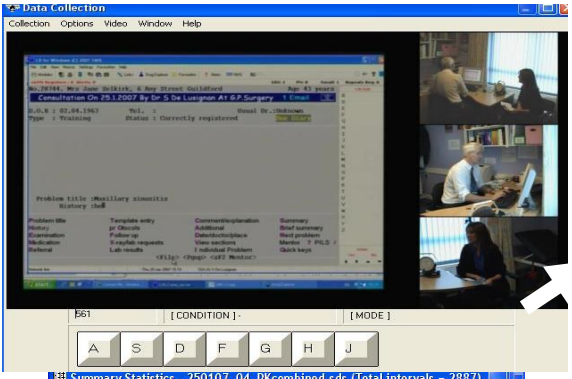
Three separate videos recording are used with digital cameras putting in doctor's room. One camera is put around the desk to record a wide angle view to both the doctor and patient to capture much of the face and bodies of the participants as possible. The other cameras are positioned to capture the doctor and patient individually. A screen capture software is used to record the computer screen and data entered into the clinical computer system in real time. After that flexible software called ObsWin15 (observational data capture tool) is used for coding consultation to keep track of the occurrence and duration of key events [5, 13].

In this phase three Videos will be watched, captured computer keyboards to distinguish interaction, the allocation of appropriate key to mark the beginning and the end of the interactions.

c. Automated Capture of Body Language

In this stage the Algol pattern recognition software is used to see the correlation between detected movements and manually detected activity. Also it measures the direction of gaze to infer the clinician-patient eye contacts. Figure 4 shows Observational

data capture using Obswin – rating interface and summary statistics.



Summary Statistics - 250107_04_PKcombined.sds (Total intervals = 2887)

Variable	Type	Intervals	% Intervals	Mean Duration	Median Duration	Onsets	Offsets
B	Duration	2523	87.39	2523.00	2523	1	1
C	Duration	1461	50.61	31.76	30	46	46
D	Duration	42	1.45	42.00	42	1	1
E	Duration	153	5.30	30.60	35	5	5
F	Duration	273	9.46	273.00	273	1	0
H	Duration	65	2.25	65.00	65	1	1
N	Duration	45	1.56	22.50	22	2	1
Q	Duration	538	18.64	22.42	13	24	24
T	Duration	362	12.54	45.25	24	8	8
V	Duration	496	17.18	18.37	7	27	27
W	Duration	572	19.81	30.11	12	19	19
X	Duration	1335	46.24	111.25	78	12	11

Fig.3: Observational data capture using Obswin – rating interface and summary statistics [5].

6.4.2 Aggregation Stage And Analysis outputs

In this stage the outcomes will aggregate from multi data collection systems into log file aggregation (LFA) application, which had been developed in-house. And it should be able to load a large number of inputs and produce outcomes that can be easily in other applications. Figure 4 shows time stamped log files created by three different consultation activity observation methods [14].

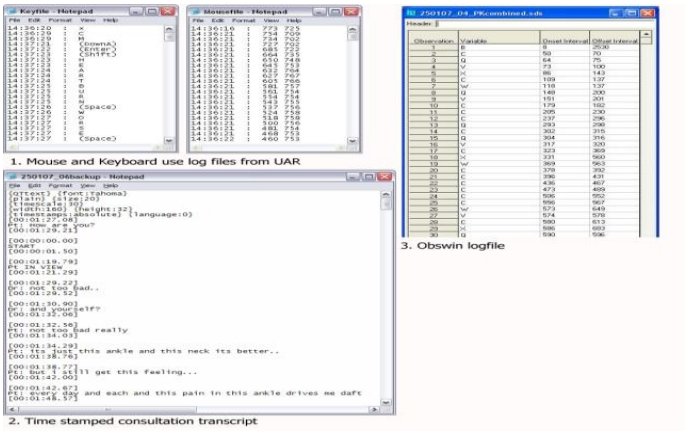


Fig.4: Time stamped log files created by three different consultation activity observation methods [5]

a. Output Which Could Facilitate Better Clinical Computer System Development

To produce easy interpretable outcomes (suitable outcome format) by computer software engineers for developing better systems. It have chosen aggregation tool to export the combined log files in XML (extensible mark-up language) format, therefore these outcomes at the same format could be imported into other application see figure 5.

b. Output UML Sequence Diagrams

Modelling and prototypes are used to describe the functional requirements of the system and the conditions for the proposed solution. Process models of consultation tasks designed by using the Unified Modelling Language (UML) as a process modelling technique for representing the using and impact of clinical system features within the consultation. In the last stage, the software should be tested to know failures and faults throughout the development cycle before final release [15, 16].

7. CONCLUSION

With the progress of technology and communications in our life; the computer has witnessed rapid development and wide spread in all the fields, it has become the backbone of almost business. It has played a significant role in the field of health care to support the clinical consulting in doctor's room. The clinical systems have failed to support a good consultation between the doctor and the patients within counselling sessions, because they based on traditional approaches. In this paper, a new development approach has been suggested to develop the clinical systems to optimise efficient interface between doctors and patients.

In this development stage, multichannel video were recorded in consulting rooms to expand the angle view of consultation. Also, the latest iteration of the ALFA toolkit has been designed to capture the intricacy of using IT in the clinical sessions, evaluate the results and compare them with traditional system results.

ALFA file has been used because it allows to get a precise observation of impact on the clinical consultation. Also, it allows for the performance of EPR systems to be evaluated regularly and to produce outcomes which could be fed directly into system design and evaluation stages. However, in the stage of automated capture of body language, the pattern recognition software had been tested to know if it could be automated the capture of body language with movements. Then The Log File Aggregation (LFA) collects any number of time -stamped log files of various formats. The data imported into LFA can be viewed as histograms or occurrence graphs. This tool has a good ability of analysis, as soon as clicking on the icon that represents a particular variable; it will convey the user directly to the suitable area in the multichannel video. In this way,

doctors will be capable to navigate into any area in the consultation they wish.

Atern DSDM has been suggested and implemented to develop these clinical systems for these purposes:

1. It could develop the interface between patients and doctors during consultation sessions according to clinical and patients' needs.
2. It aims to monitor the health and optimise the quality of the medical care.
3. It has given aim time stamps of performances within the consultation and has provided good outcomes which could be used by software engineers of computer to upgrade best systems.

Lastly, we can benefit from this new development approach with its proposed technologies and tools to develop the clinical systems in Iraq to optimise efficient interface between doctors and patients during consultation sessions.

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