Enhancing User Experience while retrieving information via Dashboard

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ABSTRACT

With rapid growth in technical and social sector, the amount of data produced and retrieved has grown exponentially. Hence, there is a dire need for a management information system (MIS) to manage and structure such data. This study was initiated to learn about the problems and needs of the employees of a truck manufacturer organisation while working for long duration projects. The information about processes and tasks is available but in an unstructured manner through excel spreadsheets which makes it difficult for users to retrieve required information during crucial times. An information system in the form of a dashboard was designed and proposed to overcome the problems faced by users. This study focuses on evaluating the user experience of employees while retrieving desired information about the procedures using both dashboard and excel spreadsheets.

To investigate the work structure and problems of employees, interviews were conducted. The results were analysed and a dashboard solution was proposed and developed with real time data. With employees coordination, few usability tests were conducted and the feedback was recorded for future work. According to the study results, the efficiency of employees can be increased and the decision making can be improved using MIS. With better retrieval techniques user experience was also enhanced. The interactive visualisations of dashboard attracted users and was used efficiently for providing tons of information about procedures to be followed.
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KEYWORDS
Management Information System, MIS, Human Computer Interaction, HCI, Excel Spreadsheet, Dashboard, User Centred Design, UCD, Prototyping, Usability Testing, Semi-structured interviews

1 INTRODUCTION
Every single day over 2.5 Quintilian bytes of data is generated and it is still growing. According to report published by DOMO, almost 90 percent of the data available at the tip of our fingers has been generated in the last two years [10]. To convert colossal data into meaningful information the pressing need for systems has been recognised [19]. New technologies and systems have been designed in the past and the research still continues to grow to manage the information available across the globe. Such systems or platforms are known as Management Information Systems (MIS) or Information Systems (IS). Dashboard are a form of Information Systems which are used to desired information in one glance.

In this study, we will look into an industrial setup at a truck manufacturer organisation where the System Owners (SO) (or users) are responsible for the software updates, development, reporting and documentation related to Electronic Control Units (ECU) for trucks and busses. Each ECU has approximately four processes named as SOP (Start of Production) running parallel per year. The duration of one SOP varies from one and a half to two years whereas the duration of each project varies from 2 to 5 years. Each SOP have Test Weeks (TW) scheduled after four weeks where the system owners could deliver and propose some new functionality for the ECU or they might skip the deadlines. During the TW, the system owner might or might not realise a new version but a major delivery release is done once at the end of every three months. A system owner is responsible for all the operations conducted over an ECU. As a part of this responsibility, the employees have to access information about different processes, procedures and upcoming tasks available in different tools, different departments and from other stakeholders. All this information about processes along with their status and deadlines is gathered and maintained within large spreadsheets (or excel spreadsheets). Prior to this study, employees have reported issues in managing this excel spreadsheets which has negative impact on their overall work process and decision making. For further understanding of these problems, a study has been conducted with the purpose of 1) understanding and revealing the underlying problems using the excel sheets and 2) to examine if a dashboard could be used to support their overall work process.

The assumption is that the dashboard would help them accessing process details and information in a much more efficient manner.
What are the problems encountered by the employees in a complex industrial setting while managing long term projects? In what ways could a dashboard support and enhance the user experience for the employees managing these issues?

First to answer these questions, semi-structured interviews have been conducted to deepen the understanding of the organisation along with the users tasks, problems and needs. Secondly, based on these interviews a dashboard was proposed and designed using real data. The efficiency, usability and interaction experience of the dashboard was studied and verified in detail using usability testing along with think out loud method.

2 BACKGROUND

2.1 Management Information System (MIS)

Davis defined MIS as "an integrated man/machine system for providing information to support the operation, management and decision-making functions in an organisation" [8]. Information System (IS) are considered the first systems of the information age. IS when used in business is known as Management Information System (MIS). The MIS are tools used for providing support to processes, intelligence, operations and IT. The MIS tools are used to manage and move the data to structure it into meaningful information [28]. MIS supports the decision making in an organisation in many different ways [3]. Dashboard is an example of one such information system where the information can be provided to the users using multiple visualisation techniques.

Dashboard - Dashboards have been used as a tool in the past to support users in decision making, to present key knowledge and to keep users updated about any change in information [6, 25]. The dashboard provides the visual display for important information to achieve the desired goal. The dashboard can provide an abundant amount of information in a consolidated and structured manner [13]. For building an IS or dashboard, research is required at early stages to know about the user, their problems and needs, the technologies involved and the interaction between the user and technologies. The research involving humans, technologies and interactions come under HCI research. HCI research is gaining importance with rapid growth and need for information systems so as to provide both users and organisations with desired results in an efficient manner [5]. For example, a website consisting of different functionalities like ‘view’ or ‘download’ and should be interactive enough to gain attention of users. Dashboards have been regarded as one of the most useful tools for analysis in past [22]. IBM’s Business Objects Dashboard Manager at Edward Hospital was used to improve cash flow by improving the management of account receivables[27] Unisys’ Marketing dashboard led to improvement in accountability, budget allocation and performance management in past [20]. The ability to access and evaluate different perspective plays an important role in performance management [24]. Since dashboards are known for improved decision making, the interest in creation of interactive dashboard has significantly increased.

2.2 Role of HCI research in MIS

Myers, Hollan and Cruz defined HCI (Human Computer Interaction) as "the study of how people design, implement and use information systems and how technologies affect individuals, organisations and society" [21]. Along with users, technologies and interaction, user experience also plays an important role as the users use the technologies for performing their daily tasks based on their needs and contexts. The information analysed after studying the interaction between users, technologies, the work environment along with the user experience helps in designing interactive and productive systems. In the past, many researchers have stressed upon the importance of HCI studies in business applications. For example, J. R. Patrick in his speech entitled "The Future of Internet" at AMCIS 2003 concluded that functionality, usability and interaction experience play an important role when the tasks are performed using systems over the internet [5].

User Experience - User Experience (UX) is concerned with understanding the users, their needs, abilities and their limitations. User experience also involves understanding the business needs and the goal of the project. The focus of user experience is to promote improved quality of user interaction with the technologies. User experience can be enhanced by developing systems using user centred design which focus on user needs and problems. Measuring and tracking usability is known for improving user experience. User experience is measured based on the interaction between the user and the product: the effectiveness (ability to complete tasks), efficiency (the amount of effort required to complete task) or satisfaction (the degree to which the user feels happy to complete the task) [2]. ISO 9241-11 ¹ states that usability is the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use [1]. Hence, the UX of a system can be improved by conducting usability tests with ‘think out loud’ which allows the practitioner to gather feedback from users about their understanding, perception and problems faced with performing the tests [16, 18]. The System developed keeping UX in focus supports in providing users with well designed and developed information systems.

But in large companies, Information Systems (IS) are structured in different manner and the information is retrieved by the employees using different techniques. In such industrial and complex work environment, a single employee is highly skilled and specialised for a specific task [7, 23]. Hence, all the information is distributed

¹https://www.sis.se/api/document/preview/611299/
across the whole company and single person is not efficient enough to gather information from all different domains [11].

3 METHOD(S)

Semi-structured Interviews and Usability testing were used to gather information and evaluate the designs throughout the study. User Centred Design approach was used for developing the designs solution [14].

3.1 Semi-Structured Interviews

Semi-structured interviews allows the researcher to ask the same set of questions to the participants but in a flexible framework. All the participants were questioned from the same set of questions in random order based on the response received from participants. The open nature of the questions encouraged the participants to express more about their experiences, the problems faced and their requirements [9]. The goal of the initial interviews was to know more about the tools used by system owners, context of use, user goals, tasks and needs.

Participants - The interviews were conducted separately with five users (P1 - P5), all aged between 30 and 60. The duration of an interview was approximately one hour. The participants consisted of four men and one woman. All the participants have been working in the industry for five or more years. The participants belonged to the same technical background and have similar process for performing the tasks although in a different order. The interviews were conducted in a professional work environment as it was known and friendly.

Interview Structure - After a short briefing session at the beginning about the goal of the study, the interviewees were asked to explain their work, their domains and the procedure followed by them to complete their tasks as the interviewer was completely unaware about it. The participants used different methods for explanation like excel sheets, diagrams and presentations to explain about their work, tools and the procedure followed by them. For example, figure 1. shows the explanation a participant gave regarding the working of the organisation with multiple small processes involved in the whole procedure. The participant used whiteboard and marker to express his knowledge.

Further, the participants were questioned about their daily tasks, requirements of those tasks, the procedure followed to meet deadlines and tools available to retrieve the desired information. The questions were open-ended and were proceeded based on the participant’s response as the interviewer wanted the session to be flexible and adaptive. Few questions were specific according to their experience, their perception and the ECU they were working on. This helped the interviewer in gathering more information about the problems, needs and requirements of the participants.

3.2 User Centred Design (UCD)

ISO 13407 standard ensures that users needs are taken into account for designing and development of an interactive system [15]. The dashboard, an information system (IS), was developed using UCD to provide users with all the desired information in one place [17].

The design process was divided into four phases: requirements of users, analysing needs and problems of the system owners, designing the dashboard and evaluating the efficiency of the dashboard using usability testing.

During the requirement and analysis phase, the focus was mainly on the process followed by the target users. The users were interviewed in a professional work environment and were asked to explain in detail about their daily tasks and how they are performed. Based on the responses, the users were questioned about the problems faced and opinions for the solution to those problems. The responses were analysed and used for designing solution.

The design phase focused on building the dashboard solution according to the analysis done from previous phase. During this phase the researcher tried to build the solution keeping in mind the users problems and needs. Initially, low fidelity prototypes were built to ensure the information mentioned in the designs was accurate.

The high-fidelity designs were evaluated for the final phase. Usability testing was conducted in a professional work environment to check the efficiency and use of the dashboard in comparison to spreadsheets.

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2https://www.iso.org/standard/21197.html
3.3 Usability Testing
Usability tests are conducted for finding the interactive issues that users might face anytime in future while performing their tasks [12]. According to Dumas and Redish, for conducting usability testing five characteristics are taken into account: (1) improving the usability of the product; (2) participants should be the real users; (3) users should be given real tasks to perform; (4) the researcher can observe and record the feedback from the users; and finally (5) the researcher can analyse and make changes based on the test results [26]. Nielsen suggested that in order to conduct simple and easy user tests, “thinking out loud” is the most effective usability design evaluation technique [17]. Hence, for this study, the users were asked to perform five tasks using both current excel spreadsheets and high-fidelity prototypes separately.

Four participants (P1-P4), 2 men and 2 women were involved in the usability testing. The participants were aged between 30 and 40 years and having been working with ECUs for more than 5 years. Two of the participants (one male and one female) were interviewed earlier for gathering information about the problems and needs of the users, whereas the other two were completely new to the study.

The idea of testing with new participants was to know how much learning curve is involved in using the dashboard. All the participants were professionals and they all have multiple ECUs to take care of. The tests were conducted in a professional work environment. Each test session lasted approximately one hour and all the sessions were recorded for future reference. The test started with the brief introduction about the study and the results found from the interviews conducted earlier. Before disclosing the tasks to be performed, the participants were asked to sign a research consent form to avoid any discrepancies in future. The test tasks were based on the users daily actions and tasks. Hence, the user tried to keep the test unbiased to observe the effectiveness and efficiency of both dashboard and excel spreadsheet.

The first task required retrieving information using both excel spreadsheet and dashboard separately. The task was to list all the upcoming deliveries in the near future. Since the dashboard was designed using real time information it was easy for participants to interact with dashboard. The second task focused on the communication between different stakeholders. The participant had to contact stakeholders from ECU communication department. For performing this task, the participants first used company’s intranet to know about the stakeholder associated with the ECU and further contacted them using email. Using dashboard also, the participants had to perform the same task. For third task, the participants had to use mainly dashboard for naming the test week or the delivery week they were aiming for. It also involved listing the documentation to be delivered along with the future deadlines for the start of production. The fourth task involved retrieving status of the current deliveries through both dashboard and excel spreadsheet. The sub tasks involved gathering detailed information about the task with overdue status. It also involved knowing the reason for delay in deliveries. The final last task was to update the status of deliveries and the documentation. The sub task involved informing other stakeholders about the status as well. This task was first performed using excel spreadsheet and later the stakeholders were informed using company’s intranet. Later, it was performed using dashboard as well where the notification is automatically send to other stakeholders using email. While performing all the tasks the participants were encouraged to ‘think out loud’ to have a better understanding of their perception and the decisions taken to perform the tasks. To further verify the results, short semi-structured interviews were conducted at the end of the sessions.

Think Out Loud
During the tasks, the users were asked to articulate all the decisions taken by them. It helped the researcher in analysing the time taken by participants to learn about the dashboard, the different types of errors occurred based on the information perceived by users and their overall experience using different functionalities available in the system.

Semi-structured Interviews
Short semi-structured interviews were conducted with the users to verify the results drawn from the observations made while users performed tasks and the statements made by participants using ‘think out loud’ method. It also helped the researcher in gathering feedback on the features and visualisation used for designing the dashboard.

4 RESULTS
The results drawn from this study involves problems and needs discovered from the user interviews, user statements, design problems and the conclusions drawn from the usability testing. The text in italics below represent the results followed by a brief explanation about how and why these conclusions were made.

4.1 User Interviews
The user interviews were conducted to gather information about the tasks performed by the users along with their deadlines. A brief introduction and problems faced with multiple tools was included to know more about the task process. Few results from user interviews can be seen in figure 2. These results have been further explained later.

All users have different methods or procedures to perform their tasks
All system owners have different methods to proceed and complete their tasks based on their priority and perspective. The users complete their tasks in a different order as none of them is aware about the correct process. Also, working in a sequential order leads to delay in deliveries due to which all the work is done parallelly.
The users are not aware about the whole task process even after working for more than two years
During the interview participant P3 said: “It’s both funny and frustrating that I have been working in this domain for almost two years and still I miss out on deadlines since I don’t know the whole process. I even have to ask my colleagues for some details”. On further interviewing, the participant mentioned “the process is too long that sometimes I forget the deadlines and they keep on changing as well”. It was found that the users followed a random pattern based on their comfort level and the information they received from peers which might be flawed.

The users miss out on various deadlines
Participant P4 said “I recently forgot to deliver the specification report and later I got confronting mails from production team for quick and urgent delivery which messed my plans for two days”. When asked about the reason for missing out on deliveries the participant blamed not knowing about the process and sometimes due to workload, the system owners delay the deadlines intentionally. The users were in stress and work pressure as they are not able to meet the deadlines and the tasks were overdue. This delay in the deliveries leads to issues and confusions in future.

Need for notifications regarding any change
“When we system owners propose a release status we have to be in continuous contact with other stakeholders to know about the level approved for production” was the statement given by participant P2 when asked how they check the current work status. The users have no existing tool to check the status of work according to given deadlines. The users have to maintain contact with other stakeholders to know about the decisions taken for their ECUs. Based on the response, the participant was asked whether she keeps a tab over her previous ECUs for which she said “Yes, I do that a lot but then I need to communicate with present stakeholders of that ECU. I always keep a check on my previous ECUs as when we work on these ECUs for long years we nurture them like our babies and get attached to them emotionally”. The researcher noticed that the participants would like to have notifications about any change or update happening for both their present and past ECUs. It was interesting to see how the participants get emotionally attached the electronic units as well.

Multiple tools existing for performing different tasks
The users interact with multiple tools to give out their deliveries in time. Participant P4 who has been working with these tools for more than 10 years said “When I joined as a system owner, I was once scared knowing the amount of tools I have to use for meeting the deadlines and know about the status of those deliveries. There was no one to guide me but now after working for 10 years I have learnt by heart about the deadlines. But still I would be intriguing to see how the dashboard provides an interactive timeline to overview deadlines”.

The need for reminders
The duration of projects in large industries vary from one to two year and the deadlines change accordingly. This leads to change in future deadlines which the system owners are not aware about and need to frequently check different tools to know more about the status of their ECUs. Participant P1 suggested “I want reminders for all the upcoming tasks because I have so many deadlines in same week that I intentionally don’t deliver few less important documents as I have other priorities”. The user repeatedly mentioned the need for reminders. The participant P4 on further investigation about how the use of these reminders would affect his daily life. The participant said “I believe in planning all my work prior only to avoid any kind of hassle in the end and if I have a reminder prior I can divide my work efficiently in my team and keep monitoring the work status”. This statement attracted researcher to know how frequently the participant would like to receive reminders on which the participant replied “I would like to customise the reminders as for few important deadlines I would prefer receiving reminder maybe one month prior but for few documentation deadlines one week prior is enough”. Whereas participant P3 said “I would use the dashboard frequently so I would anyway be updated about my deadline so receiving a week prior is enough as I have learnt by heart about the deadlines. But still I would be intriguing to see how the dashboard provides an interactive timeline to overview deadlines”.

Figure 2: Some results from User Interviews
the tools required. It was so messed because I had to do deliveries but I wasn’t aware about the tools and the deadlines for those deliveries so I mostly waited till some other stakeholder would come and tell me that I have to send this documentation as well”. This statement leads to the conclusion that there is a need for specific tutorials and documentations for existing tools. The researchers also found that receiving the status updates from different platforms would make the work easier for the users.

**Difficult to contact people involved in different levels of process**
The users find it difficult to contact other stakeholders at different levels of their deliveries. Participant P5 said “When we work for different deliveries we have to talk to other teams to know about the status of their work. Sometimes we are not even aware about whom to contact as the people working in different departments keep on changing. On those times we just randomly go to any person in that department and ask for help”. It was found that the participants even after working for several years in the same domain are not aware about point of contact for their particular electronic unit as the members keep on changing.

**No records of version handling**
Based on the information provided by the participants earlier, the researcher further inquired about their need to access the deliveries made in the past and if they check whether the deliveries were similar to their existing ones or not. This made participants to think and realise that they do refer to the old deliveries but there no such system or database is existing which is why the tasks become complicated. Participant P1 said “Oh! I never thought this way and yes sometimes to update the specifications of an ECU I do refer to old documentations and deliveries. If I have a way of cross checking my present specifications with old ones, it might reduce my workload”. Also, there are no records of the actions and work done by the system owners. This shows that having the functionality of duplicating and updating the previous documentation and deliveries in dashboard will support and help system owners in saving time.

### 4.2 Designing and Prototyping

In figure 3 and figure 4, the prototypes designed as low fidelity and high fidelity have been presented. The prototypes were interactive and were proposed for usability testing.

**Low Fidelity Prototype**
During the workshop, the low fidelity prototypes were presented and it was found that there were few more problems and field left out. For Example, figure 3 shows the summary of task performed by user. The users appreciated various features like the duplication of documents, news feed for representing the action taken by any other stakeholder etc. From the feedback received from the user, it was found that not only documentation of tasks but also updating of various databases, creating and updating of new software features, testing etc are involved in the procedure and deliveries. The problems related to SOP were introduced during this workshop and additional solution was provided for these SOPs in high fidelity prototypes.

**High Fidelity Prototype**
The high fidelity prototypes were used for usability testing. Figure 4 shows the high fidelity prototype for summary page of the dashboard which can be used by the user for checking the status of an ECU along with the future deadlines and the tasks associated with those deadlines. The prototype was designed keeping company’s bootstrap in mind. The users were intrigued to see the
4.3 Usability Testing

As mentioned in methods, usability testing is used for finding interaction issues faced that users might face anytime in future while performing their tasks [12]. The testing involved performing 5 tasks using both excel spreadsheet and dashboard. The users were encouraged to ‘think out loud’ while performing the tasks and at the end of sessions short semi-structured interviews were conducted to know about the user experience and decisions taken to perform the tasks. Based on the information gathered the following results were found.

Time Efficient and Effective

We can see from Figure 5 that the average time taken to perform all the tasks using dashboard was significantly reduced in comparison to the time taken to perform the tasks using excel spreadsheet. Participant P2 said "the dashboard seems to save a lot of time for checking the status of an ECU and the deadlines for the deliveries. I can focus more on the deliveries now and perform the tasks of updating the stakeholders quickly instead of struggling to check, remember the deadlines and update my team later. It interesting to see how I can check all my deadlines for different SOPs in one timeline". Having a time efficient tool would save them time and provide user with more time to focus on their tasks. The tool is effective to use as the user was able to perform the tasks using dashboard whereas while using spreadsheet they even considered to drop the idea of performing task altogether.

Quick Decision Making and Planning

Using the dashboard, the users were able to see the changes in deadlines and the upcoming tasks. It provided them feedback while planning their schedule for performing tasks. Participant P4 stated: “I can see all the deadlines on the timeline and that would make my work easier as I can plan all my work and deliveries based on the updated deadlines”. The participant even enquired "Can I customise these timelines as I would like to use it as my personalised calendar timeline for other meeting as well". It was found that the users could plan their tasks, meetings, vacations prior as the updated deadlines were accessible. The interactive timeline supported the users in making better decisions.

Better Communication

The participants were able to communicate much faster with other stakeholders using dashboard which wasn’t possible before using the spreadsheet. Participant P1 said: "I really like this contact functionality because I don’t even know whom to contact if I have issues with PSM tool. In such case, I would just go to someone in communication team and ask whom to contact”. It was found that sometimes the users are not even familiar with other stakeholders. Participant P3 commented "Oh I didn’t know that there is something called as basic support team". The statements given by participants proved that the users are not aware about the stakeholders and tools involved in the process.

Simplifies Handover

When a new user takes over the system, using dashboard the handover will be simpler as the new user can retrieve all necessary information easily like the deadlines, deliveries, status of deliveries, other stakeholders involved and tutorial about the other interacting tools. Participant P4 said "When the ECU for bus was handover to me, I was unaware about the status of the deliveries and their deadlines. I had to continuously bug the previous system owner to know about things. I even received mails from SCOMM department to send the specifications as it was already overdue for more than 5 days". The participants even mentioned that now it would be easier for a new user to understand the terms and keywords used for the deliveries as all the users will stick to the same keywords.

Open and Transparent

The dashboard was open, transparent and easy to use. The desired information regarding different processes and tasks can be easily retrieved. The dashboard provides users with an interactive timeline where all the deadlines for the upcoming deliveries would be available. Participant P1 said “It’s good that the dashboard is open for all system owners as now we can see the status of completed
and overdue tasks. Also, if I can grant access to my software team then everyone will be notified about the change in deadlines and schedule their work and vacations”. The dashboard was also transparent as all the information is easily accessible nothing is hidden from the users.

User Satisfaction
Participant P4 while laughing said ‘Good! I’ll be saved from explaining my actions and work to higher management they can themselves see that the issue is not on my end’. During think out loud, this statement said by participant P4 shows that the user was happy about the completion of their tasks and the actions taken by her. The users felt they were able to perform the tasks in an effective manner and they were comfortable with the continuous feedback on their actions using dashboard which was not the case when tasks were performed using spreadsheet.

The results helped author conclude that using an information system would support users in their daily tasks and help in making quick decisions. The dashboard provided support to users to complete their daily tasks effectively without any hassle. This satisfied users and relieved the mental stress that gets built when they are not able to complete their tasks and meet deadlines in time. Thus, the user had an enhanced and better user experience.

5 DISCUSSION

With increase in information across the globe there has been an increase in information database for securing this data [4]. To access and retrieve this data in an efficient manner certain management information systems (MIS) have been introduced. In large scale organisation all the information is scattered and difficult to retrieve hence different retrieval techniques are used. This study was conducted in a large industrial settings to know about the problems faced by the employees of an organisation when they have to access information and perform tasks for long duration projects. The employees are currently using excel spreadsheets to perform tasks and keep a record. The study focuses on providing the system owners with dashboard, a IS to provide support and better information retrieval platform.

To support the study qualitative data was collected from semi structured interviews at initial stage. The early focus of the interviews was to have a brief introduction of the work done by the users. The interview further moved on to the problems faced by the users along with their needs and requirements. It was found that the users are not able to complete their tasks in time due to lack of information at various stages. The users even after working for several years in the company, are unaware about the whole procedure to be followed along with the various tools which are used to complete the tasks. The users miss out on deadlines because sometimes they are not aware about the tool chain involved and sometimes they are unaware about the deliveries. And since, he deadlines for the tasks change with time so the users need to keep checking multiple tools to verify the information. There are other stakeholders involved in the process for an ECUs but contacting these stakeholders is difficult for the users and the only method of contacting is company’s inline or intranet. Apart from this, there is a lack of documentation and tutorials for new users and the only support are their peers. Having multiple ECUs to work with, complicates the work for system owners as lot of information needs to be recorded, deadlines need to be followed and all these information has to be kept in mind. And till now, the excel spreadsheet could not provide enough support to store and retrieve the desired information in efficient manner.

Based on the results found from the semi-structured interviews, the dashboard was designed. The dashboard was designed using User Centred Design (UCD) keeping user needs and requirements in focus. The semi-structured interviews were used to gather information required for the requirement and analysis phase of UCD. To verify the information and the procedure described by users, low fidelity prototypes were designed and presented during the workshop. During the workshop, it was found that the users are unaware about use of previous versions used for the present deliveries and how duplicating for the previous deliveries would ease their work. The users also gave suggestion of using real time data for future designs. One of the users suggested to have interactive timeline to display all the deadlines available throughout the project.

The reviews and the feedback received from the workshop was further used for building high fidelity prototypes. The high fidelity prototype was created using real time tasks and information used by the system owners. The last phase of UCD that is usability testing was conducted with ‘think out loud’ method. Usability testing was conducted to check the efficiency of the dashboard in comparison to excel spreadsheet. The tests were conducted to check how users interact with the dashboard, what problems they might phase while using the dashboard and what further functionalities could be provided to resolve the problems faced. The tasks were performed using both the dashboard and the spreadsheet separately. While performing the tasks, used ‘think out loud’ to describe their action, their decisions and the problems they were facing. It was noticed that the the users frequently mentioned how using dashboard the tasks can be managed and it can later be used as task management tool as well. The authors found that the ‘info’ button in the design was misunderstood as the link to check about the person getting affected due to the deliveries. It was recorded that the users always perform same task in their daily life but with minor changes. But since the designs were in prototyping phase, it lead to data redundancy. The users were able to update the delivery status and inform the other stakeholders about the update much efficiently in comparison to spreadsheets. The time taken to perform five tasks was recorded and it was found that the dashboard was time efficient. The dashboard supported the participants well in both decision making and planning for their future actions. The dashboard helped the user in contacting other stakeholders quickly
and receiving frequent notifications about any change in ECU kept them up-to-date which currently using spreadsheet is not possible. For new users, the handover was much more efficient as all the desired information like upcoming deliveries, deadlines, tasks completed, task overdue, contact of other stakeholders etc. was easily accessible using dashboard. Using dashboard, the information retrieval became much more efficient in comparison to excel spreadsheets.

To verify the results and gather feedback about the user experience, final stage interviews were conducted. It was found that real data presented in redundant manner created a bit of a problem since the participants remember most of the information by heart. Regarding the feel and experience with the design, the participants were really impressed and excited to use the dashboard in their daily life as its easy to use with low learning curve, it was very clear and all the information was easily accessible. The participants were intrigued after viewing all the deadlines and related information using timeline which was both accessible and interactive. One participant explicitly mentioned how by using it frequently, they won’t have to carry the spreadsheet with them all the time. For further feedback about the functionality needed by the users, they expressed about having a well customised dashboard where they can add their other deadlines into the time and having to-do list to interact with. From the information gathered throughout the study, it was found that all the users receive the same information but since it might not be useful for everyone they would like to have extensive filtering on various levels of the dashboard.

Though the study cannot show the personal user experience of each participant explicitly, from the usability testing and interviews it was found that the users were intrigued to use the dashboard as it resolves the problems faced by the users in their daily life. The functionality of receiving reminders and notification about any changes in the work status and deadlines, it would indeed make their life easier which would lead to better decision making and future planning.

5.1 Methodology and limitations

The system owners were aware about the problems faced by them and the feedback received at the end of study benefited the findings. The number of employees interviewed might be perceived as less in number but the results at the end verified that the problems faced by the users were discovered accurately. The interviews might lack depending on the interviewer’s experience. But since the interviewer had no information prior to study, the interviews were unbiased and open for the interviewee. The designs were built using the elements and conditions present in the company’s documentation and bootstrap. Few conditions mentioned in the company’s documentation restricted the researcher from using different font styles and sizes different colours and various other elements like buttons, info symbol etc. The visualisations were also limited keeping users perspective in mind. All system owners have their own process for conducting tasks due to which following the new method and procedure might lead to rise in learning curve for few users. The interviews and tests were conducted with system owners working in the same domain for more than 2 years but a new user might have a different perspective. Since, the usability tests were conducted using both the dashboard and excel spreadsheet and participants use excel spreadsheet in their daily life, the time recorded for performing tasks could be biased towards excel sheets.

The study was conducted in a large industrial setting and the results presented in the study are scientific and research based. Hence, it can be generalised and used for different target users. The results received could be used by both large scale and small scale organisations for providing task management system for both long term and short term projects as using MIS the information about process, procedures and other necessary details can be provided in a structured manner. The MIS systems also provided users to have better visualisation of information. Since it is human tendency to miss out on some information, using MIS the information will be retrieved efficiently and effectively thus helping in making quick and better decisions.

5.2 Future Work

During the study, some new ideas regarding the functionalities and design of the dashboard emerged through discussions and interviews conducted with the users. The new ideas suggested would help in increasing the productivity and time efficiency of the users.

As suggested by one of the participants, the dashboard can be personalised according to the users and their needs. The users can have the option of filtering the desired information since the information available at present is generic which might be useful for some but not for every user. The idea of customising of the dashboard can be implemented by providing the users with various filters and other tools over the dashboard. Hence, the users can gather desired amount of information from various other existing tools.

The users can be provided a functionality to allow access to other team members to do changes in the task but the team leader should have the responsibility for granting the access. This would help the users to keep the system up to date by voiding confusions that might arise anytime in the future. More research work can be done to see how integrating other tools into the system would help the users can perform all their tasks using single tool or dashboard.

6 CONCLUSION

With the growing rate of information available around the world the need for structuring, storing and retrieving has lead to building of Management Information Systems (MIS). The Association of
What are the problems encountered by the employees in a complex industrial setting while managing long term projects?

It was found that even after working for several years, the employees are still not aware about the different tools, departments and stakeholders associated to their work since the information is scared around different tools and excel spreadsheets. The need for building better and efficient systems was discovered and the systems should be customised and structured according to user needs and requirements hence, making the information retrieval efficient.

In what ways could a dashboard support and enhance the user experience for the employees managing these issues?

It was analysed using dashboard the time efficiency was reduced, communication amongst different stakeholders was improved and the users were able to make better and efficient decisions. The overall experience of users with information available through dashboard provided support in better task planning. The results and analysis helped author conclude that using structured information the user experience of users can be enhanced.

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