

Usability process improvement and capability assessment

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SUMMARY

The usability maturity of two organisations was assessed using the model in ISO TR 18529 to identify the need for usability process improvement. The results were used to select simple user-based methods implementing the recommendations in ISO 13407 and were applied in trial development projects over a 12-month period. A second usability capability assessment at the end of the trial demonstrated an increase in usability maturity. In both cases the results were judged to be highly beneficial and cost effective, and the selected methods are now being formally incorporated into the organisations' development processes.

KEYWORDS: usability capability, usability maturity model, user-centred design, process assessment, ISO 13407

INTRODUCTION

The objective of the EU-funded TRUMP project [1] was to improve the usability capability of the development processes in two organisations: Inland Revenue/EDS (IR/EDS) and Israel Aircraft Industries (IAI). The steps taken over a period of two years were to:

1. Identify needs for usability process improvement by using the usability maturity model in ISO TR 18529 to assess the current capability of each organisation.
2. Make the identified improvements to the software development processes, by introducing simple user-based methods implementing ISO 13407 [2].
3. Reassess the usability capability the organisation to assess the extent of the improvement.
4. Identify the cost-benefits of the improvements, and integrate the methods into the documented processes.

USER CENTRED DESIGN PROCESS: ISO 13407

ISO 13407 provides guidance on achieving quality in use by incorporating user centred design activities throughout the life cycle of interactive computer-based systems. It describes user centred design as a multi-disciplinary activity, which incorporates human factors and ergonomics knowledge and techniques with the objective of enhancing effectiveness and productivity, improving human working conditions, and counteracting

the possible adverse effects of use on human health, safety and performance.

There are four user centred design activities that all need to start at the earliest stages of a project. These are to:

- understand and specify the context of use
- specify the user and organisational requirements
- produce design solutions
- evaluate designs against requirements.

The iterative nature of these activities is illustrated in Figure 1. The user centred design process involves iterating to take account of user needs until the objectives are satisfied. The sequence in which these are performed and the level of effort and detail that is appropriate varies depending on the design environment and the stage of the design process.

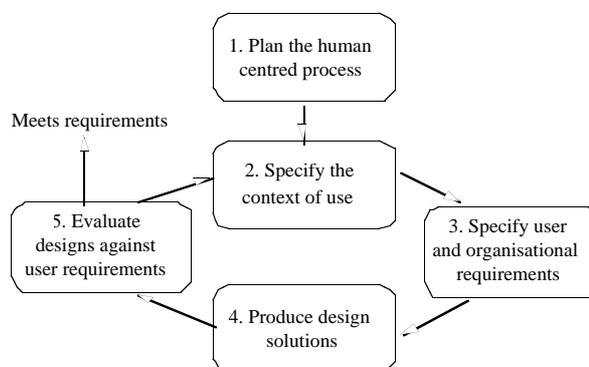


Figure 1 - User centred design activities

HUMAN-CENTRED LIFECYCLE PROCESS DESCRIPTIONS: ISO TR 18529

The EC INUSE project developed a structured and formalised definition of the human-centred processes described in ISO 13407 [4]. An improved version has subsequently been published as ISO TR 18529. This Technical Report is intended to make the contents of ISO 13407 accessible to software processes assessment and improvement specialists and to those familiar with or involved in process modelling. ISO TR 18529 can be used in the specification, assessment and improvement of the human-centred processes in system development and operation.

1	Ensure HCD content in system strategy
1.1	Represent stakeholders
1.2	Collect market intelligence
1.3	Define and plan system strategy
1.4	Collect market feedback
1.5	Analyse trends in users
2	Plan and manage the HCD process
2.1	Consult stakeholders
2.2	Identify and plan user involvement
2.3	Select human-centred methods and techniques
2.4	Ensure a human-centred approach within the team
2.5	Plan human-centred design activities
2.6	Manage human-centred activities
2.7	Champion human-centred approach
2.8	Provide support for human-centred design
3	Specify the stakeholder and organisational requirements
3.1	Clarify and document system goals
3.2	Analyse stakeholders
3.3	Assess risk to stakeholders
3.4	Define the use of the system
3.5	Generate the stakeholder and organisational requirements
3.6	Set quality in use objectives
4	Understand & specify the context of use
4.1	Identify and document user's tasks
4.2	Identify and document significant user attributes
4.3	Identify and document organisational environment
4.4	Identify and document technical environment
4.5	Identify and document physical environment
5	Produce design solutions
5.1	Allocate functions
5.2	Produce composite task model
5.3	Explore system design
5.4	Use existing knowledge to develop design solutions
5.5	Specify system and use
5.6	Develop prototypes
5.7	Develop user training
5.8	Develop user support
6	Evaluate designs against requirements
6.1	Specify and validate context of evaluation
6.2	Evaluate early prototypes in order to define the requirements for the system
6.3	Evaluate prototypes in order to improve the design
6.4	Evaluate the system to check that the stakeholder and organisational requirements have been met
6.5	Evaluate the system in order to check that the required practice has been followed
6.6	Evaluate the system in use in order to ensure that it continues to meet organisational and user needs
7	Introduce and operate the system
7.1	Management of change
7.2	Determine impact on organisation and stakeholders
7.3	Customisation and local design
7.4	Deliver user training
7.5	Support users in planned activities
7.6	Ensure conformance to workplace ergonomic legislation

Table 1. Human-centred design processes and their base practices

The Usability Maturity Model in ISO TR 18529 describes seven processes each of which contains a set of base practices (Table 1). The base practices describe what has to be done in order to represent and include the users of a system during the lifecycle. The model uses the format common to process assessment models. These models describe the processes that ought to be performed by an organisation to achieve defined technical goals. The processes in this model are described in the format defined in ISO 15504 *Software process assessment* (i.e. process name, purpose, outcomes, base practices and work products). Although the primary use of a process assessment model is for the measurement of how well an organisation carries out the processes covered by the model, such models can also be used as a description of what is required in order to design and develop effective organisational and project processes.

At both IR and IAI, a usability capability assessment was used to identify any gaps in the organisations' ability to apply user centred design. In the assessments, each base practice was rated on the scale:

- Not performed
- Partly performed
- Largely performed
- Fully performed

INLAND REVENUE/EDS: FULL ASSESSMENT

At Inland Revenue a formal assessment lasting one week was carried out by two assessors from Lloyd's Register, assisted by two usability specialists from Serco Usability Services who identified opportunities for process improvement. A total of 13 stakeholders associated with the trial project at different levels in Inland Revenue and EDS were interviewed in twelve 3-hour sessions. A conventional software process assessment procedure based on Process Professional Assessment [3] was used. This produced a detailed profile and rich information about where improvements would be beneficial. At a feedback meeting on the last day, it provided the basis for an agreed set of improvement activities.

Inland Revenue commented [1]:

"It was however a wary project team that was brought together for the first maturity assessment, uncertain what they had let themselves in for. The maturity assessment however opened everyone's eyes to:

- *The different ways user could and should be involved throughout the lifecycle;*
- *The benefits that could accrue to both the project and IR/EDS;*
- *Professional support available from Lloyds Register and Serco Usability Services.*

	Inland Revenue/EDS	IAI
Number of design and development staff	>200	40
Use a fully documented process?	Yes	No
Importance of end user needs	High	High
Experience with usability	Moderate	None
Attitude to process improvement	Committed	Committed
Number of stakeholders interviewed	13	8
Number of UMM activities judged relevant and assessed	39	33
Initial number of activities partially or not performed	19	24
Final number of activities partially or not performed	3	2

Table 2. Comparison of assessments

Output from the assessment was not only a clear eyed assessment of the level of maturity in this area but it provided a straightforward model for raising that level aimed at the heart of the development lifecycle, the facilitated workshops which are the engine of design and development stages.”

12 months later when the improvements had been made, a second similar assessment was carried out to see whether the improvement objectives had been achieved. Very significant progress had been made. When the results were presented to a meeting of senior stakeholders, the benefits were sufficient for the meeting to authorise incorporation of most of the methods into the standard Inland Revenue/EDS documented processes. The meeting also suggested that regular usability capability assessments should be arranged to monitor improvement.

IAI: WORKSHOP

By contrast, a simple one-day workshop provided the basis for process improvement at IAI. The activities in the Usability Maturity Model were used as a good practice checklist. The Serco usability specialist rated each activity as not performed, largely performed or managed, based on a short discussion with one or two developers or managers who were most knowledgeable in each area. Although some ratings may not have been completely representative, they were sufficient to provide the basis for an agreed programme of improvement.

A second workshop was held 16 months later. As the Serco usability specialist who had been carrying out the improvements also organised the second workshop, it was easy to agree on the extent of the improvement with the IAI representatives in less than two hours.

IAI commented [1]:

“The one-day assessment format was appropriate for LAHAV since it is a) a relatively small organization, and b) it has a lasting culture, commitment and infrastructure for process improvement.

The first assessment revealed many areas that needed improvement including some organizational issues. These were used to select UCD methods for trial. The second assessment purpose was to evaluate the improvements made. The detailed results are very valuable and will be used in further dissemination activities in LAHAV and other IAI divisions.”

COMPARISON

The usability capability assessment was highly effective in setting an agenda for both organisations. Could the simple one-day workshop-style assessment have been used at IR/EDS? This question was asked at the final stakeholders meeting at IR/EDS, and the opinion expressed was that IR/EDS needed the confidence provided by the thorough and impartial process capability assessment procedure.

Under what circumstances can major benefits be initiated by just a simple workshop? In a large and complex organisation like IR/EDS, it is more time consuming to identify the current situation and more complicated to obtain consensus on change. The formality and structure of a formal process capability assessment is consistent with the organisational culture, and provides the necessary detail and authority for the results obtained.

By contrast LAHAV at IAI has a smaller more flexible group where it is easier for all the main stakeholders to be involved and make rapid decisions.

Both organisations found the results so beneficial that they have adopted the methods as a normal part of their development process. At IR some methods will be

applied by usability specialists, while IAI found them sufficiently intuitive for use by members of the development team.

DISCUSSION

Does this provide a model for how to introduce user-centred design in other organisations? Jokela & Iivari [7] found assessments based directly on ISO TR 18529 less successful, which led them to develop a new assessment process based on the intended outcome of each process, rather than the specific practices. Although an ISO TR 18529 assessment can also be based on outcomes (which are listed for each process), most of the TRUMP assessment centred on the practices, which were found easy to interpret. The comparative success may have been due to the high degree of familiarity of the assessors with the ISO 18529 model, and the common goals of IAI and IR to:

- provide systems that meet user needs
- improve their processes

This management commitment to improvement and change may have been lacking in some of Jokela & Iivari's assessments.

But even IR/EDS and IAI had initial difficulty in understanding the assessment model and potential benefits of the user centred methods, which differ in nature from other software engineering activities. Jokela & Iivari report similar difficulties in conveying the meaning of the model in advance of their assessments. It is still not clear how best to present the proposed user centred design activities in a way that can be understood and appreciated by designers and developers.

We nevertheless believe that the assessment processes used in TRUMP are an effective way to successfully implement user centred design, and that the benefits obtained by IAI and IR could be replicated in other similar organisations.

ACKNOWLEDGEMENTS

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REFERENCES

1. Bevan, N, Bogomolni, I, and Ryan, N (2000) Cost-effective user centred design. www.usability.serco.com/trump
2. Bevan N, Bogomolni I, and Ryan N. (2001) Incorporating usability in the development process at Inland Revenue and Israel Aircraft Industries. Proceedings of Human-Computer Interaction INTERACT'01, IOS Press.
3. Compita (1997) Process Professional Assessment. <http://www.processprof.com>
4. Earthy, J (1998) Usability Maturity Model: Processes. INUSE deliverable D5.1.4p, see www.usability.serco.com/trump/methods/integration/assurance
5. ISO 13407 (1998) User centred design process for interactive systems.
6. ISO TR 18529 (2000) Human-centred lifecycle process descriptions
7. Jokela, T. & Iivari, N. (2001) Usability capability assessments - experimenting and developing usability maturity models. Proceedings of IHM-HCI 2001, Volume 2.