



# Using Scripting to Investigate Perceptions of the IT Helpdesk

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## ABSTRACT

*This paper describes the application of script theory to the assessment of IT helpdesk service quality. Scripts are cognitive structures which organise sequences of events in a particular context. IT helpdesk operators and IT helpdesk users were interviewed to assess their attitude to the service. They were also asked to write down the sequence of events they would expect to take place during a service interaction. Participants were given guidance as to the structure of a script using example scripts from common service interactions. A qualitative analysis of the scripts identifies some significant gaps between the expectations of the IT helpdesk customer and service provider. The study suggests that scripting may be a useful tool in other areas of information systems research, particularly in examining interactions between software developers and users.*

## INTRODUCTION

Increasingly IT departments are seen as deliverers of services to their host organisations. These services involve the provision of information to support business decision-making and development, the provision of operational systems to enable business processes and the development of information systems which enable efficient production and delivery of the organisation's products and services. The focus of the IT department moves away from the technology towards the whole service. The use of IT becomes a means to an end rather than an end in itself. IT systems are seen as tools that support the delivery of business services for which the IT department is responsible. An increasing amount of the work of the IT department then revolves around service strategy, design, development, and implementation, rather than software design, development and implementation. The focus of quality improvement activity then moves towards services quality and away from software and technology quality.

In such a service-oriented IT environment, issues of quality concern the quality of the overall service of which the actual technology quality, to which traditional software metrics may apply, is a small element of the overall quality. Hence IT departments need to look to the service industries for approaches to measure and improve service quality (Rand, 1992). The judgement of service quality relies on the perceptions and expectations of IT department customers, whether internal or external. Service quality methods examine the gap between expectations of a service to be delivered and perception of what has been delivered and provide approaches for closing the gap. (Pitt et al, 1995; Pitt et al, 1998) Such gaps may be closed both by improving the actual service delivery to match it more to the customer's expectations and altering the expectations through, for example, marketing activities (Watson et al, 1993).

This paper examines the use of scripting, a technique that documents consumer and provider expectations of the service process. The theory and practice of the technique of scripting is discussed. The results of a pilot study which applied scripting in an IT environment to study expectations of the IT helpdesk are described. Using scripting provides a dynamic approach to judging the quality of a service encounter. The results of the pilot study suggest that scripting could usefully be applied in a variety of IT service management situations within and beyond the IT helpdesk

## SCRIPT THEORY

In order to make sense of the world, people develop cognitive structures to describe what they expect to happen in a particular situation. For example,

on entering a McDonalds restaurant, the customer uses a script to act appropriately in the situation. This involves queuing at the counter, ordering, and receiving the meal on a tray. If the customer was approached by a smartly-dressed waiter and ushered to a table, the customer would be confused because such service provider's behaviour did not agree with the customer's script. Similarly, if the customer entered a McDonalds restaurant and asked for a shoe fitting, the customer's script would clearly be wrong. Scripts are knowledge structures which are organised around routinized goal-oriented activities.

Script theory was developed by Schank and Abelson (1977) as a means of encoding knowledge structures in computer programs. It has been applied in management studies as a way of mapping knowledge of processes. Leigh and McGraw (1989) applied script theory to industrial sales personnel's activities. More recently, Greenwood (2000) has applied scripting in nursing and Hibbert et al (1995) applied script theory to hairdressing as an example of a service industry.

A script involves a location where the activity takes place, defined roles and props, entry conditions, expected outcomes and a number of scenes (Schank and Abelson, 1977). Activity is targeted at achieving a goal. That goal may be divided into sub-goals.

The script will usually require exchanges between several actors taking on roles. The typical analysis occurs at the level of the dyadic interaction between the customer and the service provider (Solomon et al, 1985). The exchange that takes place between customer and provider will depend on the scripts of the participants.

Scripts are triggered by instantiating events and depend on entry conditions. For example, if one was hungry, hunger would be the instantiating event and ones goal would be to satisfy ones hunger. However, entry conditions for a restaurant will require hunger and the possession of a means to pay by the customer. If entry conditions are satisfied, a script may be invoked from the customer's memory. Similarly, a script may be invoked by the provider in response to the customer's request. In a restaurant, roles may include customer, waiter, cook, cashier, and owner - all acting according to their own scripts. The customer selects a script according to the type of restaurant.

The use of scripting in service quality involves the comparison of customer and provider scripts, the analysis of the differences and the implementation of changes to close the gaps. Understanding the customer's script and point of view will increase service quality. Scripts may differ in content and elaborateness. Frequently, provider scripts are more elaborate and detailed than customer's scripts. If some actions appear in more detail in the customer script than in the provider script this may point to a potential reduction in service quality. Scripts may start and end at different points, again creating service quality gaps. Hibbert et al (1995) found that the customer's script started before the provider's script. While the hairdresser considered that the service interaction started when the customer entered the salon, customers considered the script to begin when an appointment was booked.

Scripts may be strong or weak. Strong scripts include expectations of sequence as well as occurrence of events. Weak scripts do not include sequence expectations. Schank and Abelson (1977) defined a situational script as one where, in a particular context, participants have interlocking roles and share an understanding of what's supposed to happen. The focus of service industry scripting studies is on strong, situational scripts which are examined for mismatches.

## THE ROLE OF IT HELPDESKS

In IT service delivery, the internal helpdesk has a pivotal role in delivering IT services within the organisations and determining service quality. The traditional role of the IT help desk is in providing technical IT solutions for non-technical users. It provides the key interface between users and IT professionals and is the hub of IT services activity. The support of existing information systems and the introduction of new information systems may be managed and monitored from the help desk. Indeed IT help desks may have a strategic role in the take-up and management of information systems (Marcella and Middleton, 1996). Critically, internal helpdesks will be the link to external maintenance providers. The speed and accuracy of diagnosis, together with the identification of the supplier and the time-to-contact, will all be integral parts of any mission-critical system (Czegel, 1998; Bruton, 2002). However, despite its key role at the heart of the IT department, the helpdesk tends to have a poor image.

User interaction may start with the help desk when hardware and software is installed at the user's desk. The help desk will support and manage the installation process, help the user get started on the company's network and support application training. The help desk has also traditionally focussed on reactive support, receiving requests for help, filtering requests and allocating technical resources to resolving problems arising out of the requests. However, IT help desks may be moving towards a more proactive role, becoming the 'human face' of IT, servicing requests for new systems, arranging user training, monitoring business benefits of delivered information systems and negotiating and evaluating service level agreements (Bruton, 2002).

The perception of IT helpdesk service quality will be significantly influenced by the quality of the service encounter between the internal customer and the helpdesk technicians. Indeed, the IT helpdesk service encounter provides an ideal candidate for examining service quality gaps using scripting. Differences in scripts between the helpdesk customer and the service provider may have a significance influence on the perception of the service.

## METHOD

Helpdesk staff and end users in a city council were interviewed. The IT services department of the council comprised some 104 staff. As part of the Town Clerk's Department, it provided a variety of IT support services. It operated a help desk for internal customers which looked after the front office activities and directed requests to technical services. The help desk was managed using a Quetzal system. Calls were classified according to three levels of priority and the help desk was run on the basis of service level agreements developed by the customer service manager. Four staff ran the help desk, supported by a manager.

All help desk staff and three end users were interviewed. The structured interviews explored the interviewee's attitude to the help desk. Following the interview, respondents were asked to write a script describing their interaction with a the helpdesk as customers, or the steps they undertook in delivering the service as IT staff. Respondents were given examples of scripts for a visit to a hairdresser, attending a lecture and going to a restaurant. The small size of the sample precludes any quantitative analysis. Scripts were compared using a small database to identify similarities and differences.

## ANALYSING THE INTERVIEWS

Both helpdesk workers and end-users expressed a positive attitude to the helpdesk. The interview data helped identify the goals of stakeholders in the helpdesk process. Both customers and providers were focused on resolving the query in as short a time as possible. The concerns of helpdesk staff centred on the quality of the supporting technology and staffing issues, particularly levels of staffing and staff turnover. Themes of customer care, communication and efficient response were highlighted.

The end users interviewed were generally satisfied with the helpdesk. They were positive about helpdesk personnel's levels of understanding, aware of the importance of IT, and focussed on the importance of efficient and speedy resolution of queries. The end-users involved in this pilot study all attempted to resolve problems before contacting the help desk, although their level of technical knowledge was generally low. While a small sample may be biased in favour of the helpdesk, the interviews functioned to elicit context for the scripts. The similar level of understanding of IT purpose and of the goal of the service

interaction between helpdesk personnel and end-users may suggest that differences in scripts reflect different cognitive models of the service interaction process, rather than conflicting goals or attitudes.

## ANALYSING THE SCRIPTS

Schank and Abelson (1977) focused on how a script is developed and used approaches derived from artificial intelligence to enable the encoding of scripts in a form which could be represented in a computer program. Hibbert et al (1995) analysed scripts in terms of sub-goals and derived a master list of sub-goals. Their analysis was very much statistically focussed, examining frequencies of sub-goals and quantifying elaborateness using chi-square analysis. We take a more qualitative view, drawing out interpretations from individual scripts, highlighting qualitatively significant differences and drawing some conclusions. Scripts may be treated as texts, which can be analysed as a form of literature. The following sections analyse some scripts from helpdesk operators and end users individually. The analysis will then focus of differences between helpdesk service provider and end-user scripts.

### Helpdesk Operator Script 1

SCRIPT TYPE: HELP DESK

MAIN GOAL: RESOLVE QUERY

SUBGOALS:

CUSTOMER CALLS  
ANSWER PHONE  
ASK QUESTIONS  
OPEN CALL  
ADD DETAILS  
GIVE CUSTOMER RESPONSE TIME  
ALLOCATE CALL  
TECHNICIAN CALLS CUSTOMER  
FIND RELEVANT SERVER  
RESET PASSWORD  
ADVISE CUSTOMER PASSWORD RESET  
CHECK CUSTOMER OK  
END CALL

The helpdesk operator imagines a specific call to reset a password, in itself a very common activity. The script splits into three scenes: receiving the call, technicians calling the user, and the helpdesk operator checking with the customer before closing the call. Receiving the call itself splits into interactions with the customer and with the computerised helpdesk system. The script indicates that interaction with the helpdesk computer system is important, but not necessarily a driver of the call.

### Helpdesk Operator Script 2

SCRIPT TYPE: HELPDESK

MAIN GOAL: RESOLVE QUERY

SUBGOALS:

SWITCH PC ON  
LOG INTO PC  
OPEN UP CALL SYSTEM  
LOG INTO PHONE SYSTEM  
PICK UP UNFINISHED WORK  
ANSWER PHONE  
GREET CUSTOMER  
TAKE CUSTOMER DETAILS  
OPEN CALL  
CUSTOMER DETAILS APPEAR  
ASK QUESTIONS

ADD CUSTOMER DETAILS  
 ADD MACHINE DETAILS  
 CONFIRM CUSTOMER DETAILS  
 CONFIRM MACHINE DETAILS  
 AGREE PRIORITY  
 CALL REF  
 RESPONSE TIME  
 ALLOCATE CALL

In this case the helpdesk operator's script starts with logging on to the helpdesk system. There is a great deal more elaboration on the use of the helpdesk system. Indeed it may be suggested that the script is being driven by the computer system's requirements. The script ends once the call is allocated. This script includes agreeing priority, which script 1 does not mention.

### Helpdesk Operator Script 3

SCRIPT TYPE: HELPDESK  
 MAIN GOAL: RESOLVE QUERY  
 SUBGOALS:  
 ANSWER PHONE  
 GREET CUSTOMER  
 ADD CUSTOMER DETAILS  
 ADD MACHINE DETAILS  
 ADD DEPT DETAILS  
 ADD LOCATION DETAILS  
 ASK QUESTIONS  
 ADD CUSTOMER COMMENTS TO CALL  
 AGREE PRIORITY  
 THANK CUSTOMER  
 ALLOCATE CALL  
 END CALL

This third example script also elaborates on the computer system dialogue and suggests that the help desk system dialogue is an important driver. Both agreeing priority and communicating a response time are mentioned, but again the script ends once the call is allocated.

### Helpdesk Operator Script 4

TYPE OF SCRIPT: HELPDESK  
 MAIN GOAL: RESOLVE QUERY  
 SUBGOALS:  
 ANSWER PHONE  
 GREET CUSTOMER  
 LISTEN TO PROBLEM  
 ASK QUESTIONS  
 LISTEN TO ANSWERS  
 PROBE CUST FOR MORE INFO  
 OPEN CALL  
 ADD CUSTOMER DETAILS  
 ADD MACHINE DETAILS  
 AGREE PRIORITY  
 CALL REF  
 RESPONSE TIME  
 END CALL

This final example of a helpdesk operator's script is less elaborate in terms of computer interaction and somewhat more customer-focused. It is the script only that includes listening to the customer. Again, the call ends once the response time has been communicated. It makes no reference to closing the call.

### End User Script 1

SCRIPT TYPE: END USER  
 MAIN GOAL: RESOLVE QUERY  
 SUBGOALS:  
 CALL HELPDESK  
 WAIT FOR REPLY  
 GIVE NAME  
 GIVE LOCATION  
 EXPLAIN PROBLEM  
 REPLY TO SECONDARY QUESTIONS  
 AGREE PRIORITY  
 CALL REF  
 WAIT  
 ENGINEER ARRIVES  
 DESCRIBE PROBLEM IN DEPTH  
 LEAVE ENGINEER TO RESOLVE PROBLEM  
 RESPOND TO SECONDARY ENQUIRY BY ENGINEER  
 NOTE WHEN PROBLEM FIXED  
 WAIT(LATER)  
 RECEIVE CALL FROM HELPDESK  
 GIVE SATISFACTION RATING  
 END

The end user script contains three scenes. Firstly, the call is made, next the engineer visit is received and finally the call is closed. Furthermore, three wait events occur. The script may indicate that waiting is considered a significant issue. The end-user specifically notes down when the problem is fixed.

### End User Script 2

TYPE OF SCRIPT: END USER  
 MAIN GOAL: RESOLVE QUERY  
 SUBGOALS:  
 LOG CALL IN CENTRAL REGISTER  
 CALL HELPDESK  
 GREET OPERATOR  
 EXPLAIN PROBLEM  
 AGREE PRIORITY  
 CALL REF  
 CHECK DETAILS OF CALL WITH HELPDESK  
 END CALL  
 ASSIGN CALL REF IN CENTRAL REGISTER

Significantly, this end-user script involves a user-maintained log, the Central Register, maintained by the Central Payroll. The script begins an ends with the Central Register. The script does not refer to problem resolution or call closure. The interview suggested that the respondent was not particularly concerned with call resolution since she would just do other work while waiting for the call to be dealt with. Furthermore, it may be that interaction with the Central Register is seen as the point at which ownership of the problem ceases for this user and becomes someone else's responsibility.

### End User Script 3

TYPE OF SCRIPT: END USER  
 MAIN GOAL: RESOLVE QUERY  
 SUBGOALS:  
 PICK UP PHONE

CALL HELPDESK  
 EXPLAIN PROBLEM  
 AGREE PRIORITY  
 CALL REF  
 RESPONSE TIME  
 ENGINEER ARRIVES  
 DESCRIBE PROBLEM IN DEPTH  
 LEAVE ENGINEER TO RESOLVE PROBLEM  
 GIVE SATISFACTION RATING

The third end user script includes interaction with the engineer and a return call either to or from the help desk to give a satisfaction rating.

## DISCUSSION

### Understanding and interpreting scripts

Scripts provide a rich source of material for examining service interactions. Analysis of their content will identify interesting themes, key issues and problems and suggest where service improvement may be found. The following discussion illustrates the types of issues that may arise.

Studying scripts involves identifying differences and similarities. Differences may indicate divergent underlying concerns between customers and providers. When a script starts and ends may be significant. Omissions from scripts and sub-goals that occur rarely should be looked for. The particular concerns of participants may be indicated by scenes or sub-goals which get elaborated. Participants may attend in more detail to elements of the service encounter which cause them particular concern. Dependencies between provider and customer scripts should be considered. Scripts may indicate key interaction points and concerns common to providers and customers which will need careful attention in improving the service encounter.

It is also useful to consider the overall encounter. How is the script structured? What are the underlying scenes? What other roles are involved? If individual scripts are missing scenes or sub-goals within scenes this may indicate a service encounter problem.

### Understanding the Helpdesk Operator's Scripts

The helpdesk script's ideal overall structure consists of three scenes: the call, the problem resolution and the call-back to check for problem closure. Completion of these three scenes will fulfil the goal of rapid problem resolution. The main means of communication is the telephone, although increasingly, communication with the helpdesk takes place through e-mails (Hahn, 1998). Besides the internal customer and the helpdesk operator, other roles may include the support technicians and support managers. The principle prop is the helpdesk support system. Entry conditions include knowledge of the availability of the helpdesk by the customer, and the occurrence of a computer problem the customer cannot mend. The outcome should be that the problem is resolved and the customer can resume full work activities. Preferably the customer should be pleased with the service received.

Helpdesk operator scripts start with taking a call. Operator 2 adds a scene logging on to the call system, which would occur at the start of the day. Three out of four end the script when the call is allocated, only one extends the script to include the call-back scene, checking that the customer's call has been dealt with adequately. This may suggest a lack of attention to customer satisfaction and a possible area for training. Three out of four scripts involve greeting the customer. However, only one operator was sensitive to the need to listen to the customer. Clearly in any service encounter, listening is a key skill which may need to be highlighted. Agreeing a priority and giving a response time may be key interaction points.

Scripts that extend into the domains of other actors may indicate more awareness of the overall process. Helpdesk operator script 1 includes the technician's action in resolving the problem, which the other helpdesk operator scripts do not. This scene is of interest to all end-users. The absence of this scene suggests that helpdesk operators do not address the whole process of problem resolution. This may result in a lack of empathy with the customer who is clearly interested in what is actually done to their PCs. Helpdesk operators should be encouraged to extend their scripts to include all scenes which concern the end-users.

Three of the scripts contain a significant number of sub-goals concerning data input into the helpdesk computer system. In one script the extent of

elaboration of the computer system dialog suggests that the system is the focus of the script and the script may be driven by the computer system. Such sub-goals are not of interest to end-users. Information elicited by the helpdesk operators may be seen as a 'Reply to secondary questions' sub-goal by the end-user or part of 'Explain the problem'. Service encounters which are effectively driven by the supporting computer systems carry a number of risks. The information required by the computer system may not be central to the service encounter and may not be in tune with the customer's concerns. Gathering information seen as irrelevant to the customer may slow down the service interaction and be perceived as time-wasting by the customer. It will be necessary in the service encounter to ensure that dialog is effectively conducted with the computer system and is not inhibiting the flow of the service encounter. These scripts suggest that the information requirements of the computer system can have a significant effect on the service encounter. Therefore it is important that information systems designers elicit customer and provider scripts before defining the computer dialog.

### Understanding end-user scripts

Where the end-user retains responsibility for the problem, a scene involving interaction with the support technician appears. Importantly, the end-user describes the problem twice and differentiates between the detail of problem description. In the interview, end-users indicated that repeating the problem to several people was annoying.

For end-user 2, ownership of the problem is relinquished once the problem is recorded on the Central Register. The script also suggests a concern as to whether the helpdesk has understood her and recorded the problem correctly. This may also indicate a wish to relinquish responsibility for the call as quickly as possible by assuring the problem is properly logged and then becomes the concern of the owner of the Central Register.

The end-user scripts also suggest that 'Agree Priority' is a pivotal point in the service encounter. It may be that further investigation is required to see if there is a possible conflict at this point.

### Examining the Service Interaction

Comparing the content of helpdesk operator and end-user scripts raises some significant points. Firstly, end-user scripts end when a satisfaction rating has been given and not when the call has been allocated. This suggests a need to educate helpdesk operators to extend the scope of their scripts.

Secondly, interaction with the support engineer to resolve the problem is part of the end-user script. Helpdesk operators need to be aware of this in order to provide an empathic service.

Thirdly, waiting is not part of the helpdesk operator's script, but is implicitly or explicitly part of the end-user's script. Customer sub-goals which are not visible to the provider may be important in delivering good service quality.

Fourthly, the extent to which the computer system is driving the interaction needs to be considered. This may be adding unnecessary sub-goals to the script which are not concerned with the main goal of rapid problem resolution.

Finally, comparison of the scripts identifies key interaction points which may act as sources of conflict and dissatisfaction with the service. This study suggests that agreeing the priority is pivotal.

### Uses of Scripting

This study illustrates the value of scripting in teasing out important issues in a service interaction which may affect service quality. Script analysis can play a useful role in improving the helpdesk service interaction. However, it may also be of value in other areas of the IT department where service interaction take place and customers or users interact with IT staff. For example, it may be particularly useful in analysing the systems development process and defining developer and user expectations. Moves towards rapid application development, joint application development, client-led system development and extreme programming will result in extended service interaction between users and developers. Understanding expectations using scripting may point to valuable changes in systems development processes.

This study also suggests that scripting may be valuable as a system development tool for supporting the design and development of information systems to support service interactions. Understanding service provider and customer scripts may enable the development of a common script that would raise service quality (Mohr and Bitner, 1991). Script analysis may enable the de-

velopment of computer dialogs which support the flow of the service interaction. The role of the computer system in the service interaction is itself an area for further research. In this study the scripts suggested that the computer system was not adequately supporting the service encounter and may have been imposing an additional stress on what was already a stress-laden interaction.

## REFERENCES

- Bruton, N. (2002), *How to Manage the IT Help Desk*, 2nd Edition, Butterworth-Heinemann, London.
- Czege, B., (1998) *Running an Effective Helpdesk*, John Wiley, Chichester.
- Greenwood, J. (2000) Critical thinking and nursing scripts: the case for the development of both. *Journal of Advanced Nursing*, 31, 428 - 436
- Gremler, D.D; Bitner, M.J. and Evans, K.R. (1993) The internal service encounter. *International Journal of Service Industry Management* 5(2) 34 - 56.
- Hahn, K. (1998). Qualitative investigation of an e-mail mediated help service. *Internet Research*, Vol. 8, No. 2, pp. 123 - 135.
- Hubbert, A.R., Sehorn, A.G. and Brown, S.W. (1995) Service expectations: the consumer versus the provider. *International Journal of Service Industry Management* 6(1), 6- 21.
- Leigh, T.W. and McGraw, P.F. (1989) Mapping procedural knowledge of industrial sales personnel: a script theoretic investigation. *Journal of Marketing* 53, 16-34
- Marcella, R. and Middleton, I. (1996), The role of the help desk in the strategic management of information systems. *OCLC Systems and Services*, Vol. 12, No. 4, pp. 4 - 19.
- Mohr, L.A and Bitner, M.J. (1991) Mutual understanding between customers and employees in service encounters' *Advances in Consumer Research*, 18, 611-617.
- Pitt, L, Watson, R.T and Kavana, C.B. (1995) Service Quality: A measure of information systems effectiveness. *MIS Quarterly* 19,173 -
- Pitt, L, Berthon, P and Lane, N. (1998) Gaps within the IS department: barriers to service quality. *Journal of Information Technology* 13, 191-200
- Rands, T (1992) Information technology as a service operation. *Journal of Information Technology* 7, 189-201.
- Reynoso, J and Moores, B. (1996) Towards the measurement of internal service quality. *International Journal of Service Industry Management* 6(3), 64 - 83.
- Schank, R and Abelson, R. (1977) *Scripts, Plans, Goals and Understanding*. Lawrence Erlbaum, New Jersey.
- Solomon, M.R., Surprenant, C, Czepiel, J.A. and Gutman, E.G. (1985) A role theory perspective on dyadic interactions: the service encounter. *Journal of Marketing* 49, 99-111
- Watson, R.T., Pitt, L; Cunningham, C.J. and Nel, D. (1993) User satisfaction and service quality of the IT department: closing the gaps. *Journal of Information Technology*, 8, 257-265.

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