

Guideline for ERROR MESSAGES

Heuristics for writing
good error messages



GERMAN UPA

Berufsverband der Deutschen Usability
und User Experience Professionals

Foreword

Errors happen and cannot always be avoided in a digital application. If an error occurs, users must be informed about it. This document provides support for writing helpful error messages. The guidelines are simple heuristics (rules of thumb) supplemented by practical examples. Helpful error messages are the aim of this guide.

This guide supplements the German UPA's "Leitfaden UX-Writing" ("Guidelines for UX Writing").

*THERE WILL BE ERRORS.
Carefully prepared error messages are
therefore essential for the success of
your products.*

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Section 1.

Heuristics

Section 1

Heuristics

Error messages should be constructive, comprehensible, concise and empathic.

These heuristics (rules of thumb) apply to text-based error messages of interactive systems. They can also be applied to informative messages and warnings. They are not applicable to all interactive systems, for example video games, eGames and VR systems.

It is important to protect users from errors. The interaction principle for dealing with situations in which users encounter an error is called "Use error robustness." It has three parts:

- Use error avoidance: Help users to avoid mistakes.
- Use error tolerance: Be tolerant of mistakes.
- Use error recovery: Support users in correcting errors.

This guide deals exclusively with recovery.

Further information on use error robustness, error avoidance and error tolerance can be found in ISO standard 9241-110 [L2] and in the CPUX-F curriculum [L4]

Use Error Robustness

Avoidance
Tolerance
Recovery

Two good starting points for writing good error messages are:

1. The error occurs because the interactive system is unable to understand what users want. The users have done nothing wrong.
2. Think about what possible solutions there are and what recommendation a knowledgeable and friendly person would give the user if they were available.

Most of the error messages in the examples in this guide assume that it is not possible to change the interactive system. A system often improves significantly when the developers and the authors of the error messages work closely together.

Quality has its price. The number of error messages increases because you need more specific error messages than generic ones. The effort required to maintain meaningful error messages is also higher than for generic error messages such as "Something went wrong". However, the effort is worth it, because more precise messages allow users to accomplish more on their own, which in turn can lead to savings in the hotline.

The heuristics sometimes contradict each other. For example, constructive error messages are not always concise. The same applies to empathic error messages. The UX professional must find a suitable compromise here.

*The four heuristics:
Good error messages are*

Constructive
Comprehensible
Concise
Empathic

Heuristic 1

Constructive

Heuristic 1

Constructive



Description

A constructive error message guides users to solve the problem that has arisen. Constructive error messages provide orientation, create security and promote rapid troubleshooting.



Checklist

- Does the error message convey what users can do to solve the problem?
- Does the error message contain all relevant information for users?



Tips

- Feel free to use explanatory examples in error messages.
The choice of examples is not trivial. "5.11.2022" is not a good example of a date. Germans would interpret it as November 5, people with an American background as May 11. Better is "24.11.2022". Even better is to change the date format, for example "24 Nov 2022".
- Be transparent. Provide all available information that could help users solve the problem.
- Repeat the data entered by users to show users how the interactive system has interpreted their input.
- Test the error messages in a usability test to find out which information is relevant for users. More on this in the section "Evaluating the design solution against user requirements".

*A constructive error message
never blames the user.
It explains what the user can do
to solve the problem.*

Negative example	Positive example
"Invalid amount."	"The system does not understand the amount. Examples of understandable entries are 11,000.75 and 1025"
"This username is already in use"	"The username clara@mail.de is already in use. Similar available usernames are clara99@mail.de, clara_schmidt@mail.de and clara_s@mail.de"
"Invalid input: dress size"	"The dress sizes range from 5 to 16. You have entered 2."
"Wrong input"	"You have entered HELP, which is not recognized by this system. Permitted commands are: SAVE, LOAD or EXPLAIN."
"No search results found"	<p>"No search results found.</p> <p>Suggestions:</p> <ul style="list-style-type: none"> - Try again with fewer search terms. - Replace one or more search words with other words that have the same meaning. - Use the navigation to find what you are looking for. - Use <u>help</u> - the help contains good examples. - Contact the <u>support</u> team. We are here to help you."

Heuristic 2

Comprehensible

Heuristic 2

Comprehensible



Description

A comprehensible error message is easy to understand for users. Clear language with terms and formulations that users are familiar with is essential.



Checklist

- Are all words and phrases in the error message understandable for the target group?



Tips

- Use examples, tooltips and easily recognizable links to pop-ups to explain necessary technical terms.
- Write in the active tense so that users immediately understand what they are supposed to do and what the system does. See example 3.
- If numbers or codes are required, for example to facilitate troubleshooting by experts, place them at the end of the message. See example 4.
- Avoid technical terms and foreign words, for example, "validate", "verify", "suffix".
- Write short, concise sentences that are written in plain English so that someone who is not a native English speaker can understand them.
- Be careful with ambiguous words such as "Cancel" or "Discard" on buttons in error messages. For example: "The task is still in progress. Are you sure you want to cancel the task?" Does the answer button "Cancel" cancel the task or the question? Use the unambiguous button labels "Cancel task" and "Continue task" instead.

*A comprehensible error message
speaks the language of the users.*

Negative example	Positive example
<p>"Password: At least 8 characters, including upper and lower case letters, 1 number and 1 of the following special characters: "!_:-@, #, \$ %"</p>	<p>"Rules for passwords: They must have at least 16 characters. Make it something that's easy for you to remember but difficult for others to guess. For example, use four common random words: zebraumbrellaishappy" <i>Comment: This requires a change of the code.</i></p>
<p>"File locked. Access denied."</p>	<p>"This file is currently being edited by John Smith (john_smith@company.com). It is therefore blocked for other users." <i>Comment: It depends on the context whether the exact specification of the user complies with data protection.</i></p>
<p>"The form must be completed before the money can be transferred."</p>	<p>"You must fill in the form first. Then we can transfer the money."</p>
<p>"Error 404"</p>	<p>"The page you requested could not be found. The page may have been removed or the address may have changed. Try one of the following options: 1. check that the address entered is correct. 2. try again later. 3. use the search function. 4. if the problem persists, please contact us, and state the address used and the following error code: Error 404."</p>

Heuristic 3

Concise

Heuristic 3

Concise



Description

A concise error message provides a succinct description of the error.



Checklist

- Is the error message free of superfluous words and phrases?
- Does the error message describe exactly one single cause of the error?



Tips

- Write an error message for every diagnosable error, even if the exact diagnosis is complicated. Avoid imprecise error messages where the error message lists a few, possible, different error causes and leaves it up to the user to determine which of the listed errors has actually occurred.
- Be as brief as possible.
- Think about whether words like "please" and "unfortunately" are necessary.

A concise error message describes exactly one single cause of error in concise form.

Negative example	Positive example
"The password you have entered is either too short or contains invalid characters."	<i>Either</i> "The password you entered is too short. It should contain at least 16 characters." <i>or</i> "The password you have entered contains "\$". Our system does not accept this character. The following special characters are accepted: # + ? ! & . "
"The photo you want to upload is probably very nice. Unfortunately, it's a bit too big for us. Try one that is no more than 4,000 pixels high and 4,000 pixels wide."	"The photo you are trying to upload is too large. Try to reduce it so that it is smaller than 20MB."
"Not so fast. Please check this box."	"You must accept the terms of use."

Heuristic 4

Empathic

Heuristic 4

Empathic



Description

An empathic error message is perceived by users as polite and respectful. Kindness and humor can be used with care.



Checklist

- If users were facing you, would you dare to say the error message out loud?
- Does the error message make users feel stupid or does it blame them for the problem? Avoid words like "wrong", "invalid", "error" or "illegal". Such words are not empathic.
- Does the error message scare or threaten users? We don't want to shout at anyone. Therefore, avoid exclamation marks and words written in capital letters. Two or more exclamation marks in a row should never occur.



Tips

- The use of words such as "sorry" and "unfortunately" are not enough to lend empathy to an error message.
- Use kindness and humor with care. When users see a humorous error message for the fifth time because the error message is not constructive, the humor suddenly sounds sarcastic. Mailchimp's guide explicitly says: "Don't overdo it with the jokes – forced humor can be worse than none at all".

*An empathic error message
follows the usual rules of politeness.*

Negative example	Positive example
"ILLEGAL PASSWORD!"	"Your password does not match the saved password. Please check your password and try again. If this does not help, click on 'Forgot your password?'"
"An unknown error has occurred."	<p>"Internal system error. We have made a mistake. We regret our mistake. Please try again – preferably with a different browser. If the problem persists, write an email to support@company.com describing what you were doing when the error occurred."</p>
<p>"The password you have entered is incorrect because it violates one or more of the following rules:</p> <ul style="list-style-type: none"> - A password must consist of at least 16 characters. - A password must contain both upper- and lower-case letters - A password must contain at least one digit - A password must contain exactly one of the following special characters: !_:@, #; \$%" 	<p>"To protect your data, the password must be</p> <ul style="list-style-type: none"> - be at least 16 characters long OK - contain both upper- and lower-case letters OK - contain at least one digit OK - contain at least one of the following special characters: !_:@, #; \$% Not OK <p>Click here for an explanation of why these rules have to be so complicated."</p> <p><i>Comment: The positive example shows exactly which of the four rules was not observed. It would be much better to change the system so that the only rule would be 'at least 16 characters and digits'.</i></p>
"0 results for 'Barrak Obama' "	<p>"We did not find any results for 'Barrak Obama'. Did you mean 'Barack Obama'? Here are the results: ..."</p>

Further heuristics

Other heuristics that do not directly influence the text:

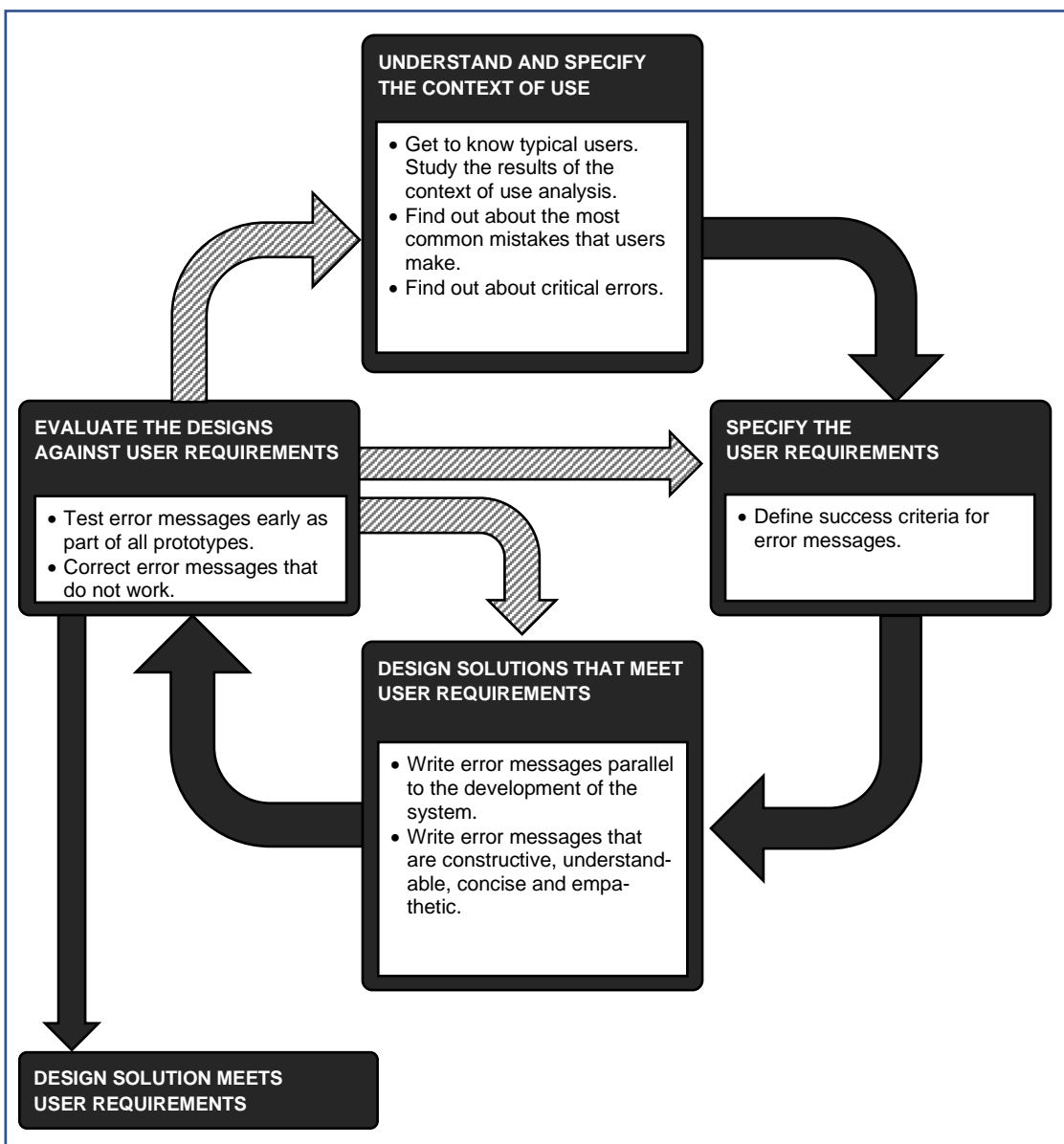
- The error message must be placed near the location where the error occurs (law of proximity).
- The error message must be clearly visible.
- The error message must be accessible. If a button is grayed out, an explanation of why the button is inactive must be available as a tooltip.
- If several errors occur on a page, show a reasonable number of them, not just one error.

Section 2.

Procedure for Creating Good Error Messages

Procedure for Creating Good Error Messages

Figure 1: The human-centered design process for error messages based on the CPUX-F curriculum [L4], which is based on the ISO 9241-210 standard [L3].



Not everyone can write good error messages. Writing good error messages, like writing poems, essays or advertisements, requires experience, practice and a feel for how users react.

Understand and Specify the Context of Use

The purpose of this activity is to understand and describe the context of use, that is, who the users are, what they do, what problems they have and what their requirements for the system are. To determine the context of use, interviews, focus groups and user surveys as well as observations of users performing their tasks are conducted.

- Get to know the context of use, especially the users. Study the results of the context of use analysis, especially the language of the users, some of which is described in the vocabulary or taxonomy. Think about what you can incorporate into the error messages.
- Investigate what users usually enter and compare this with the technical features of the system to determine where errors occur.
- Find out what the most common errors are.
- Inquire about error situations that prevent users from completing their task or pose a risk of major harm to users or the organization.

Specify the User Requirements

User requirements are precise criteria from the user's perspective that the interactive system must fulfil before it is released.

- Often, no user requirements for error messages exist.
- User requirements for error messages are success criteria for the evaluation of error messages, especially error messages for critical errors. Example: "When users receive an error message about a critical error, they must demonstrate that they have understood the message by initiating a corrective action within 45 seconds."

Design Solutions that Meet User Requirements

Prototypes are developed based on the context of use and user requirements. The prototypes are evaluated by users and improved until they meet the user requirements, and the system is ready for use.

- Write error messages parallel to the development of the system.
- Write error messages that are constructive, comprehensible, concise and empathic.
- If it is difficult to write a good error message, work closely with the designers and developers to design the best possible error message within the limits of technical feasibility.

And remember: The best error message is no error message. Perhaps the system can be rebuilt to be error-tolerant in some places so that no errors occur.

- Use examples in the error messages to explain terms and procedures that are difficult to understand.
- Pay attention to consistency: Use words from the uniform organizational dictionary (vocabulary, taxonomy) as far as possible.

Evaluate the Designs Against User Requirements

A usability evaluation determines whether an interactive system or a prototype of an interactive system fulfils the user requirements and applicable interaction principles, heuristics and design rules or whether it does not.

- Test error messages as part of the usability tests of the prototypes.
- Ask competent colleagues or consultants to review the error messages, for example based on the four heuristics in this guideline. Ideally, there a committee with people who know the context of use and the user requirements should review all error messages and coordinate them across projects.
- Check the spelling and grammar, either using word processing software, manually, or both. Note: Word processing software almost never finds all spelling and grammar errors.
- Change error messages and retest them if usability evaluations show that inaccurate error messages cause serious, critical or catastrophic usability problems.

Maintenance

Error messages must be constantly maintained. After the system is released, small or large changes are often made that affect the error messages. In addition, despite thorough usability tests, some error messages may need to be improved.

- Conduct usability tests after the system has been released, especially with experienced users as soon as they are available.
- Talk to the customer service regularly to find out what problems users have with the system. Changes to the error messages can often avoid contacts with customer service.

Tips

- All usability tests, including early usability tests, should include critical error situations. It is a common mistake that usability tests only include the happy paths.

Examples:

Happy Path: Complete delivery can take place immediately.

Error situation: Delivery must be made in several partial deliveries.

Happy Path: Few e-mails in the inbox.

Error situation: No space to receive further e-mails.

- Write error messages early so that they can be thoroughly tested and reviewed. Avoid at all costs that error messages are written the night before the system is released by people who do not know the four heuristics, the context of use and the user requirements.

Creating usable error messages – Summary

Start early
Observe the four heuristics
Test, test, test.

Section 3.

Self-Assessment Exercises

Self-Assessment Exercises

This section contains examples that you can use to test your understanding of the heuristics. Each example describes a scenario. Please write a good error message for each scenario. On the next page, we propose a solution for each example.

All tasks involve the Restaurant.com website. On this website, guests who have visited a restaurant can share their experience with other guests.

Exercises

1. Time out

The user has logged in, but they have not been active for the past 1024 seconds. The system has therefore automatically logged the user out.

2. Possible attempt to trick the system

The user attempts to rate a restaurant for the second time.

3. Maintenance work

The website is temporarily unavailable due to planned maintenance work.

*Do you consider the four heuristics
rather self-evident?
Use these three exercises
to test your skills.*

Proposed Solutions

1. Time out

For security reasons, we have logged you out of Restaurant.com. We do this automatically if you have not been active on the website for about 15 minutes.

You can login again here.

Comment: The time before users are logged out must be specified. See Heuristic 1, Constructive, tip 2.

The time specification "1024 seconds" is alien to users. We replaced it by "about 15 minutes". "About 17 minutes" would be more accurate and is also acceptable but sounds rather fussy.

2. Possible attempt to trick the system

You rated this restaurant on 26/07/2022. Unfortunately, the system cannot handle two reviews of the same restaurant written by the same user.

If you would like to edit your previous review, click [here](#).

If you want your new review to replace the one you already submitted, click [here](#).

Comment: This limitation is unreasonable. The right thing would be to allow two or more ratings. This would make the error message superfluous.

The text "on 26/07/2022" in the error message illustrates the tip "Constructive – Be transparent". See Heuristic 1 Constructive, tip 2.

3. Maintenance work

The website is unavailable on Tuesday, November 8th from 03:00 to 06:00 due to planned maintenance work. We apologize for any inconvenience this may cause you.

If you have any questions, you can contact us by telephone on 0800 33 03001 or by e-mail at info@restaurant.com.

Comment: This error message illustrates the tip "Constructive – Be transparent". The messages "The website is temporarily unavailable due to planned maintenance work" and "The website is unavailable for the next three hours due to planned maintenance work" are not constructive.

If You Want to Know More

The four heuristics are inspired by [L5]. During the development of this Guideline, similar heuristics for error messages [L6] appeared.

- L1 Kinneret Yifrah: UX-Writing and Microcopy
Microcopy, The Complete Guide, www.microcopybook.com
- L2 ISO 9241-110 Interaction principles, www.iso.org
und www.beuth.de/de/norm/din-en-iso-9241-110/320862700
- L3 ISO 9241-210 Human-centered design of interactive systems, www.iso.org and
www.beuth.de/de/norm/din-en-iso-9241-210/313017070
- L4 CPUX-F Curriculum, Foundation Level,
www.uxqb.org, available free of charge in German and English
- L5 Ben Shneiderman: Designing Computer System Messages,
Communications of the ACM, September 1982, pages 610-611
- L6´ Tim Neusesser and Evan Sunwall: Error-Message Guidelines.
www.nngroup.com/articles/error-message-guidelines/

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