Structuring requirements in open source software

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Appendices

A. Requirements

In this appendix, the set of requirements that are selected for the case study are shown. For each open source product, 10 requirements are selected. Moreover, 10 user stories are selected.

GIMP

Table 1: Requirements Open Source Product GIMP

#	Requirement	Format	Date	Source
G1	Add a "Pixel Grid" option on the View menu	Gitlab: issue request	11-10-2021	https://gitlab.gnome.org/GNOME/gimp/-/issues/7344
G2	Change tool size by half-double only	Gitlab: issue request	02-10-2021	https://gitlab.gnome.org/GNOME/gimp/-/issues/7295
G3	Add a new favorites menu for any frequently used commands and filters	Gitlab: issue request	01-10-2020	https://gitlab.gnome.org/GNOME/gimp/-/issues/5602
G4	Implement touchpad gestures for zooming in/out the canvas	Gitlab: merge request	01-02-2021	https://gitlab.gnome.org/GNOME/gimp/-/merge_requests/401
G5	Add installation tags to installed files	Gitlab: merge request	01-01-2021	https://gitlab.gnome.org/GNOME/gimp/-/merge_requests/372
G6	Holding the control key shall temporarily engage remove mode, no matter what the current mode	Wiki: warp tool specification	05-09-2011	http://gui.gimp.org/index.php?title=Warp_tool_specification
G7	At the cursor centre the current mode shall be reflected by showing the same icon as on the mode button in the tool options	Wiki: warp tool specification	05-09-2011	http://gui.gimp.org/index.php?title=Warp_tool_specification
G8	With no image open, the toolbox and every non-functional dialog shall be greyed out.	Wiki: no image open specification	30-03-2008	https://gui.gimp.org/index.php?title=No_image_open_specification
G9	Support SwatchBooker file format for palettes and gradients	Wiki: roadmap	19-07-2021	https://wiki.gimp.org/wiki/Roadmap
G10	Optionally save undo history in the XCF	Wiki: roadmap	19-07-2021	https://wiki.gimp.org/wiki/Roadmap

OpenKM

Table 2: Requirements Open Source Product OpenKM

#	Requirement	Format	Date	Source
O1	Add OMR feature	Github: issue request	16-10-2016	https://github.com/openkm/document-management-system/issues/29
O2	Implement extra TabDocuments, TabFolder and TabMail in the GWT	Github: issue request	18-04-2021	https://github.com/openkm/document-management-system/issues/281
O3	Add login and logout automation events	Github: issue request	21-04-2019	https://github.com/openkm/document-management-system/pull/179
O4	Implement drag and drop to upload files	Github: issue request	18-10-2019	https://github.com/openkm/document-management-system/issues/206
O5	Basic email sending function in CE	Github: pull request	22-09-2021	https://github.com/openkm/document-management-system/pull/308
O6	Customization of email notification	OpenKM forum	24-06-2019	https://forum.openkm.com/viewtopic.php?t=22489
O7	Converting emails to PDF	OpenKM forum	18-10-2014	https://forum.openkm.com/viewtopic.php?p=30262&hilit=requirement
O8	Whenever the assignment or modification of metadata involves changing a file's location, the user will be informed of the event	OpenKM blog	24-09-2021	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html
O9	Tasks can involve multiple users, including actors like the auditors of the task or event	OpenKM blog	24-09-2021	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html
O10	When copying a file, users can specify the name of the document copy	OpenKM blog	24-09-2021	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html

Home Assistant

Table 3: Requirements Open Source Product Home Assistant

#	Requirement	Format	Date	Source
H1	Add a filters in search bar	Github: issue request	14-03-2021	https://github.com/home-assistant/home-assistant.io/issues/16996
H2	Label custom components in integration panel	Github: issue request	19-02-2020	https://github.com/home-assistant/frontend/issues/4923
H3	Display area in more-info dialogs	Github: issue request	05-09-2019	https://github.com/home-assistant/frontend/issues/3630
H4	Ability to reorder Dropdown options	Github: issue request	12-03-2020	https://github.com/home-assistant/frontend/issues/5149
H5	Show notification when settings saved	Github: issue request	01-09-2019	https://github.com/home-assistant/frontend/issues/3562
H6	Allow stacked graphs for multiple solar production sources	Home Assistant feature requests	06-08-2021	https://community.home-assistant.io/t/allow-stacked-graphs-for-multiple-solar-production-sources/327412
H7	Option to hide "min/max" legends in the statistics graph	Home Assistant feature requests	09-08-2021	https://community.home-assistant.io/t/option-to-hide-min-max-legends-in-the-statistics-graph/328440

H8	Add battery to energy dashboard	Home Assistant feature requests	06-08-2021	https://community.home-assistant.io/t/add-battery-to-energy-dashboard/327527
H9	Add a cost and total fields to the energy dashboard 'monitor individual devices'	Home Assistant feature requests	09-09-2021	https://community.home-assistant.io/t/add-a-cost-and-total-fields-to-the-energy-dashboard-monitor-individual-devices/337142
H10	Allow gas consumption in l instead only m^3	Home Assistant feature requests	04-09-2021	https://community.home-assistant.io/t/allow-gas-consumption-in-l-instead-only-m/335642

User stories

Table 4: User stories

#	Requirement	Product	Source
U1	As an Agency user, I want to accurately see who created a submission, so that I'm not confused about who last updated a submission.	Federal spending planner website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/53c0266c-5a81-4ca9-92ea-d4b904a8703e
U2	As a site member, I want to send an email to any member via a form, so that we can connect.	Scrum alliance course website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/b9c640a3-2fa0-4689-902a-3fca016121de
U3	As a camp administrator, I want to be able to assign different positions to the staff members, so that it is possible to organize activities in terms of responsibilities.	Camp organizer website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/91b00556-70fa-4947-ba18-9daf49a2b2bd
U4	As a Publisher, I want to permanently delete a data package, so that it no longer takes up storage space.	Datahub website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/7904070c-a73b-4986-b694-8ba8b2ab53cc
U5	As an Owner, I want to edit my profile, so that it is updated with new information.	Datahub website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/7904070c-a73b-4986-b694-8ba8b2ab53cc
U6	As a researcher, I want to extract the description of the data collected, so that I can reuse it for the writing of a data paper.	Data archive website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/adf93dac-2b07-492d-b7ec-09848652c713
U7	As a faculty member, I want to access a collection within the repository, so that I can obtain research materials.	Library management website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/6830d7d1-2fc2-4f5c-ac14-e769e8b17ab7
U8	As a Staff member, I want to Schedule a Meeting, so that I can bring the required parties together at a specific date/time to address an issue.	Governmental planner website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/61142dcc-5135-4309-95d1-435633d7577d
U9	As a user, I want to be able to anonymously view public information, so that I know about recycling centers near me before creating an account.	Recycling information website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/7b6d2578-00d1-4d19-b580-02fc64a9a7db
U10	As an archivist, I want to mark individual files as restricted, so that they don't get shared by mistake.	Data archive website	https://data.mendeley.com/datasets/7zbk8zsd8y/1/files/38ae442a-2ce7-4f73-af0e-8ccae20d2bb2

B. Stanford CoreNLP output

GIMP

G1
VB DT NNP NNP NN IN DT NNP NN
Add a " Pixel Grid " option on the View menu

G2
VB NN NN IN NN HYPH JJ RB
Change tool size by half – double only

G3
VB DT JJ NNS NN IN DT RB VBN NNS CC NNS
Add a new favorites menu for any frequently used commands and filters

G4
VB NN NNS IN VBG IN HYPH RP DT NN
Implement touchpad gestures for zooming in / out the canvas

G5
VB NN NNS IN VBN NNS
Add installation tags to installed files

G6
VBG DT NN JJ MD RB VB VB NN RB RB WP DT JJ NN
Holding the control key shall temporarily engage remove mode , no matter what the current mode

G7
IN DT NN NN DT JJ NN MD VB VBN IN VBG DT JJ NN IN IN DT NN NN IN DT
At the cursor centre the current mode shall be reflected by showing the same icon as on the mode button in the
NN NNS
tool options

G8
IN DT NN JJ DT NN CC DT JJ NN MD VB VBN RP
With no image open , the toolbox and every non-functional dialog shall be greyed out .

G9
NN NN NN NN IN NNS CC NNS
Support SwatchBooker file format for palettes and gradients

G10
RB VB VB NN IN DT NN
Optionally save undo history in the XCF

Fig. 1: POS tags GIMP requirements

OpenKM

O1
VB NNP NN
Add OMR feature

O2
VB JJ NNS NNP CC NNP IN DT NN
Implement extra TabDocuments , TabFolder and TabMail in the GWT

O3
VB JJ NNS NNP CC NNP IN DT NN
Implement extra TabDocuments , TabFolder and TabMail in the GWT

O4
VB NN CC VB IN NN NNS
Implement drag and drop to upload files

O5
JJ NN VBG NN IN NN
Basic email sending function in CE

O6
NN IN NN NN
Customization of email notification

O7
VBG NNS IN NN
Converting emails to PDF

O8
WRB DT NN CC NN IN NN VBZ VBG DT NN POS NN DT NN MD VB
Whenever the assignment or modification of metadata involves changing a file 's location , the user will be
VBN IN DT NN
informed of the event

O9
NNS MD VB JJ NNS VBG NNS IN DT NNS IN DT NN CC NN
Tasks can involve multiple users , including actors like the auditors of the task or event

O10
WRB VBG DT NN NNS MD VB DT NN IN DT NN NN
When copying a file , users can specify the name of the document copy

Fig. 2: POS tags OpenKM requirements

Home Assistant

Fig. 3: POS tags Home Assistant requirements

User Stories

Fig. 4: POS tags User Stories

C. Analysis - number of tag occurrences

In the following tables, the results are shown of the part-of-speech tagging concerning the number of times the tags occur. For each requirement, it is noted how many times the tag occurred. The grey rows (*T) show the total number of times the tags occurred for all requirements. The totals are calculated for each open source product and for the set of user stories. For a quick comparison, the last table shows all totals for each open source product. The abbreviations used for the tags are described by Santorini [?]

GIMP

Table 5: Number of POS tag occurrences in GIMP Requirements

#	CC	DT	IN	JJ	MD	NN	NNP	NNS	PRP	RB	RP
G1		2	1			1	3				
G2			1	1		3				1	
G3	1	2	1	1		1		3		1	
G4		1	1			2		1			1
G5			1			1		2			
G6		2		2	1	3				3	
G7		4	4	2	1	7		1			
G8	1	3	1	3	1	3					1
G9	1		1			4		2			
G10		1	1			2				1	
GT	3	15	12	8	3	27	3	9	0	6	2

#	TO	VB	VBD	VBG	VBN	VBP	VBZ	WDT	WP	WRB	,
G1		1									
G2		1									
G3		1		1							
G4		1		1							
G5		1		1							
G6		2		1					1		1
G7		1		1	1						
G8		1		1							1
G9											
G10		2									
GT	0	11	0	3	4	0	0	0	1	0	2

OpenKM

Table 6: Number of POS tag occurrences in OpenKM Requirements

#	CC	DT	IN	JJ	MD	NN	NNP	NNS	PRP	RB	RP
O1						1	1				
O2	1	1	1	1			2	1			
O3	1					2		1			
O4	1		1			2		1			
O5			1	1		3					
O6			1			3					
O7			1			1		1			
O8	1	4	2		1	7					
O9	1	2	2	1	1	2		3			
O10		3	1		1	3		1			
OT	5	10	10	3	3	24	3	8	0	0	0

#	TO	VB	VBD	VBG	VBN	VBP	VBZ	WDT	WP	WRB	,
O1		1									
O2		1									1
O3		1									
O4		2									
O5				1							
O6											
O7				1							
O8		1		1	1		1			1	1
O9		1		1							1
O10		1		1						1	1
OT	0	8	0	5	1	0	1	0	0	2	4

Home Assistant

Table 7: Number of POS tag occurrences in Home Assistant Requirements

#	CC	DT	IN	JJ	MD	NN	NNP	NNS	PRP	RB	RP
H1		1	1			2		1			
H2			1			4		1			
H3			1			2		1		1	
H4						1	1	1			
H5						2		1			
H6			1	2		1		2			
H7		1	1			4		2			
H8			1			3					
H9	1	2	1	2		4		2			
H10			1			3				2	
HT	1	3	8	4	0	26	1	11	0	3	0

#	TO	VB	VBD	VBG	VBN	VBP	VBZ	WDT	WP	WRB	,
H1		1									
H2											
H3		1									
H4	1	1									
H5		1							1		
H6		1			1						
H7	1	1									
H8		1									
H9		2									
H10		1									
HT	2	9	1	0	1	0	0	0	0	1	0

User stories

The total number of tag occurrences is considered for the user stories without the fixed user story template (As a ..., I want to ..., so that ...). After the total, the number of tag occurrences is given with the fixed template (marked by an asterisk *).

Table 8: Number of POS tag occurrences in User Stories

#	CC	DT	IN	JJ	MD	NN	NNP	NNS	PRP	RB	RP
U1		2	1	1		4			1	3	
U2		3	2		1	5			1		
U3		1	3	3		3		5	1		
U4		1				5			1	3	1
U5			1	1		3			2		
U6		4	3		1	5		1	2		
U7		2	2		1	5		1	1		
U8		4	1	1	1	6		1	1	1	
U9		1	3	2		3		1	2	1	
U10			1	2		2		1	1	1	
UT	0	18	17	10	4	41	0	10	13	9	1
*		1	3						1		
UT*	0	28	47	10	4	41	0	10	23	9	1

#	TO	VB	VBD	VBG	VBN	VBP	VBZ	WDT	WP	WRB	,
U1		1	2			1			2		
U2		2									
U3	2	2					1				
U4		1					1				
U5		1			1		1				
U6		2			1						
U7		2									
U8	1	3			1						
U9	1	2		1		1					
U10		2			2	1					
UT	4	18	2	1	5	2	3	0	2	0	0
*	1					1					2
UT*	14	18	2	1	5	12	3	0	2	0	29

* = user story template tags: As a ..., I want to ..., so that ....

D: Analysis - Tags sequence

Glossary

Stanford CoreNLP tool has a fixed number of tags which it makes a distinction between [?]. However, for analysing the tag sequence, this distinction is not needed. For example, whether a noun is singular or plural is not of value for looking at the sequence between tags. Therefore, in the following table it is included which tags are used for the analysis and to which tags in the NLP tool they correspond.

Table 9: Glossary of POS tags used in analysis

Tag	Tags in NLP tool	Part-of-speech
CC	CC	Conjunctions
IN	IN	Preposition
JJ	JJ	Adjectives
NN	NN, NNP, NNS	Nouns
PR	PRP	Pronouns
R	RB, RP	Adverbs
VB	VB, VBD, VBG, VBN, VBP, VBZ, MD	Verbs
WH	WDT, WP, WRB	Wh-words

GIMP

Table 10: POS tag sequences GIMP

Sequence number	Sequence	Occurs in	Number of occurrences
S1	NN-NN	G1 (3x), G2, G3 (2x), G4, G5, G7 (3x), G9 (3x)	14
S2	VB-NN	G1, G2, G3, G4, G5 (2x), G6 (2x), G10	9
S3	NN-IN	G1, G2, G3, G4, G5, G7 (2x), G9, G10	9
S4	IN-NN	G1, G2, G7 (3x), G8, G9, G10	8
S5	VB-VB	G6, G7 (2x), G8 (2x), G10	6
S6	JJ-NN	G3, G6, G7 (2x), G8 (2x)	6
S7	NN-JJ	G2, G6, G7, G8	4
S8	R-VB	G3, G6, G10	3
S9	IN-VB	G4, G5, G7	3
S10	VB-JJ	G3, G7	2
S11	IN-R	G3, G4	2
S12	VB-IN	G4, G7	2
S13	VB-R	G6, G8	2
S14	NN-VB	G7, G8	2
S15	NN-CC	G8, G9	2

OpenKM

Table 11: POS tag sequences OpenKM

Sequence number	Sequence	Occurs in	Number of occurrences
S1	NN-NN	O1, O2, O3 (2x), O4, O6, O8 (2x), O10 (2x)	10
S4	IN-NN	O2, O4, O5, O6, O7, O8 (2x), O9 (2x), O10	10
S2	VB-NN	O1, O3, O4, O5, O7, O8, O9, O10 (2x)	9
S3	NN-IN	O2, O5, O6, O7, O8, O9 (2x), O10	8
S14	NN-VB	O5, O8 (2x), O9 (2x), O10	6
S5	VB-VB	O8 (3x), O9, O10	5
S15	NN-CC	O2, O3, O4, O8, O9	5
S16	CC-NN	O2, O3, O8, O9	4
S6	JJ-NN	O2, O5, O9	3
S12	VB-IN	O4, O8	2
S10	VB-JJ	O2, O9	2

Home Assistant

Table 12: POS tag sequences Home Assistant

Sequence number	Sequence	Occurs in	Number of occurrences
S1	NN-NN	H1, H2 (3x), H3, H4, H5, H6, H7 (3x), H8, H9, H10	14
S2	VB-NN	H1, H3, H4, H6, H7, H8, H9, H10	8
S3	NN-IN	H1, H2, H3, H6, H7, H8, H9, H10	8
S4	IN-NN	H1, H2, H7, H8, H9, H10	6
S14	NN-VB	H4, H5, H7, H9	4
S6	JJ-NN	H6, H9 (2x)	3
S17	R-NN	H3, H10	2

User stories

Table 13: POS tag sequences in "As a [role] " part of User Stories

Sequence number	Sequence	Occurs in	Number of occurrences
S18	NN	U4, U5, U6, U9, U10	5
S1	NN-NN	U1, U2, U3, U7, U8	5

Table 14: POS tag sequences in "I want to [action] " part of User Stories

Sequence number	Sequence	Occurs in	Number of occurrences
S2	VB-NN	U1, U2, U4, U6, U7, U8	6
S3	NN-IN	U2 (2x), U3, U6, U7, U10	6
S4	IN-NN	U2 (2x), U3, U6, U7	5
S10	VB-JJ	U3 (2x), U9 (2x), U10	5
S6	JJ-NN	U3, U9, U10	3
S8	R-VB	U1, U4	2
S1	NN-NN	U3, U4	2

Table 15: POS tag sequences in "so that [benefit] " part of User Stories

Sequence number	Sequence	Occurs in	So that . . . .
S19	PR-VB	U1, U2, U3, U5, U6, U7, U8, U9, U10	9
S5	VB-VB	U2, U5, U6, U7, U8 (2x), U10	7
S1	NN-NN	U3 (2x), U4, U6, U7, U9	6
S2	VB-NN	U1, U3, U7, U8 (2x), U9	6
S4	IN-NN	U6 (2x), U9, U10	4
S13	VB-R	U1, U4, U10	3
S8	R-VB	U1, U4, U10	3
S12	VB-IN	U5, U9, U10	3
S6	JJ-NN	U5, U8 (2x)	3
S20	PR-IN	U6, U8, U9	3
S3	NN-IN	U5, U9	2
S21	IN-JJ	U5, U8	2

Totals

Table 16: POS tag sequences in total

Sequence number	Sequence	GIMP	OpenKM	Home Assistant	User Stories				Totals
					Total	As a	I want to	So that	
S1	NN-NN	14	10	14	13	5	2	6	51
S2	VB-NN	9	9	8	12		6	6	38
S3	NN-IN	9	8	8	8		6	2	33
S4	IN-NN	8	10	6	9		5	4	33
S5	VB-VB	6	5		7			7	18
S6	JJ-NN	6	3	3	6		3	3	18
S7	NN-JJ	4							4
S8	R-VB	3			5		2	3	8
S9	IN-VB	3							3
S10	VB-JJ	2	2		5		5		9
S11	IN-R	2							2
S12	VB-IN	2	2		3			3	7
S13	VB-R	2			3			3	5
S14	NN-VB	2	6	4					12
S15	NN-CC	2	5						7
S16	CC-NN		4						4
S17	R-NN			2					2
S18	N				5	5			10
S19	PR-VB				9			9	9
S20	PR-IN				3			3	3
S21	IN-JJ				2			2	2

E: Requirements to user stories

In the following tables, the original requirements are reformulated to user stories. For each requirement, a rationale is given of how the role/action/benefit is derived, together with it's source.

GIMP

Table 17: GIMP requirements reformulated in a User Story format

#	Requirement	User story	Rationale	Source
G1	Add a "Pixel Grid" option on the View menu	As a graphic designer, I want to have an option for pixel grids in the view menu, so that I can immediately edit pixel art.	Having a pixel grid option eliminates the need for re-configuring the grid option in a seperate menu	https://gitlab.gnome.org/GNOME/gimp/-/issues/7344
G2	Change tool size by half-double only	As a graphic designer, I want to change the tool size by half only when making use of relative scrolling, so that I can fine-tune brushes better.	The tool size changes quickly when changing tool size relatively, and it might help to have the size change more slowly when scrolling.	https://gitlab.gnome.org/GNOME/gimp/-/issues/7295
G3	Add a new favorites menu for any frequently used commands and filters	As a graphic designer, I want to have frequently used commands and filters in a favorites menu, so that I can immediately use my favourite commands.	Gimp has many commands in long complicated menus, and a faster way is needed.	https://gitlab.gnome.org/GNOME/gimp/-/issues/5602
G4	Implement touchpad gestures for zooming in/out the canvas	As a graphic designer, I want to have a zoom in and out function within the canvas by making touchpad pinch gestures, so that I can change distance with my fingers.	There are multipliers needed when zooming in/out within the canvas, and time can be saved if distance can be changed by gestures accordingly	https://gitlab.gnome.org/GNOME/gimp/-/merge_requests/401
G5	Add installation tags to installed files	As a developer, I want to add installation tags to files that need to be installed, so that I can install only a selected subset of the installable files.	Adding installation tags can save the users time, so that they do not have to install individual files.	https://gitlab.gnome.org/GNOME/gimp/-/merge_requests/474
G6	Holding the control key shall temporarily engage remove mode, no matter what the current mode	As a graphic designer, I want to hold the control key to engage remove mode, so that I can go to remove mode immediately with this shortcut.	Having a shortcut saves the user time when needing to go to remove mode.	http://gui.gimp.org/index.php?title=Warp_tool_specification
G7	At the cursor centre the current mode shall be reflected by showing the same icon as on the mode button in the tool options	As a graphic designer, I want to have the same icon showing at the cursor centre as on the mode button in the tool options, so that it is clear which tool I selected.	Usability can be increased when it is clear for the user what kind of tool is selected by showing it at the cursor centre.	http://gui.gimp.org/index.php?title=Warp_tool_specification
G8	With no image open, the toolbox and every non-functional dialog shall be greyed out.	As a graphic designer, I want to have the toolbox and every non-functional dialog greyed out when no image is open, so that it is clear that these options cannot be selected.	Usability can be increased when it is clear for the user which options can be selected.	https://gui.gimp.org/index.php?title=No_image_open_specification
G9	Support SwatchBooker file format for palettes and gradients	As a SwatchBooker designer, I want to have support for file formats for palettes and gradients originating from SwatchBooker, so that I can reuse pallets and gradients made in SwatchBooker.	If a user makes use of SwatchBooker, it is valuable to be able to support the palettes from this other environment.	https://wiki.gimp.org/wiki/Roadmap
G10	Optionally save undo history in the XCF	As a graphic designer, I want to save the undo history in an XCF file, so that I can look at the undo history again.	Saving information on how the undo history is changed might provide the users with more insight.	https://wiki.gimp.org/wiki/Roadmap

OpenKM

Table 18: OpenKM requirements reformulated in a User Story format

#	Requirement	User story	Rationale	Source
O1	Add OMR feature	As a document manager, I want to have an Optical Mark Recognition (OMR) feature, so that I can easily collect data.	Having an OMR feature gives the opportunity to easily extract data from computer systems, surveys or other files	https://github.com/openkm/document-management-system/issues/29 AND https://www.webopedia.\com/definitions/omr/
O2	Implement extra TabDocuments, TabFolder and TabMail in the GWT	As a document manager, I want to have extra tabs for documents, folders and mails in the GWT, so that I can immediately access those when I am in the GWT mode.	GWT is open technology used for writing source code, and is an additional window in OpenKM.	https://www.openkm.com/wiki/index.php/Debugging_with_GWT AND https://github.com/openkm/document-management-system/issues/281
O3	Add login and logout automation events	As an OpenKM user, I want to have an automatic log-in and log-out function, so that I can save time.	Being able to automatically log in and out instead of having to enter a username and password every time saves time.	https://github.com/openkm/document-management-system/pull/179
O4	Implement drag and drop to upload files	As a document manager, I want to have drag and drop options for uploading files, so that I can immediately upload multiple files.	A drag and drop option instead of the select option, could be easier and save time.	https://github.com/openkm/document-management-system/issues/206 AND https://ux.stackexchange.com/questions/56829/what-is-the-usability-benefit-of-drag-files-images-here
O5	Basic email sending function in CE	As a document manager, I want to send an email in the community edition, so that I can easily send my latest updates to an email account.	CE stands for community edition, while there is also a professional edition of OpenKm.	https://github.com/openkm/document-management-\system/pull/308
O6	Customization of email notification	As a document manager, I want to customize email notification messages, so that I can send the receiver an appropriate message.	In some cases it is useful to customize the notification message.	https://forum.openkm.com/viewtopic.php?t=22489
O7	Converting emails to PDF	As a document reader, I want to convert my emails to a PDF document, so that I can easily download my emails.	Having the ability to convert mail to a PDF format makes it easy to save the email locally on the computer or print it.	https://forum.openkm.com/viewtopic.php?p=30262&hilit=requirement
O8	Whenever the assignment or modification of metadata involves changing a file's location, the user will be informed of the event	As a document manager, I want to be informed when the location of a file changes, so that I can still find the file.	Whenever the location of a file changes without the user knowing this, this can cause the user to not be able to find the file at a later time.	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html
O9	Tasks can involve multiple users, including actors like the auditors of the task or event	As an administrator, I want to involve multiple users in a task, so that I can divide the work.	When a task or event is very large and this is too much work for one person, the work of a task or event should be divided among several people to save time.	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html
O10	When copying a file, users can specify the name of the document copy	As a document manager, I want to specify a new name of a copied file, so I can give the document a suitable name.	In order to have a clear understanding of the content of a file and what the file applies to, the name should be able to be changed.	https://www.openkm.com/blog/improvements-of-ui-and-ux-of-openkm.html

Home Assistant

Table 19: Home Assistant requirements reformulated in a User Story format

#	Requirement	User story	Rationale	Source
H1	Add a filters in search bar	As an app user, I want to have filters in the search bar, so that I get more specific outcome results.	The ability to add specific filters to a search function can give the user more specific results and thus save time.	https://github.com/home-assistant/home-assistant.io/issues/16996
H2	Label custom components in integration panel	As a developer, I want to label custom component in an integration panel, so that I know which components I need for debugging.	There are two components (core and custom) and when knowing which component it is, valuable information for debugging can be derived.	https://github.com/home-assistant/frontend/issues/4923
H3	Display area in more-info dialogs	As a device owner, I want to display areas for devices in dialogs with more information, so that I can distinguish devices with the same name.	The possibility exists that people have multiple devices with the same name, and it would be easier if a distinction can be made between these devices by being able to add the area of each device.	https://github.com/home-assistant/frontend/issues/3630
H4	Ability to reorder Dropdown options	As an app user, I want to reorder my items in the dropdown menu, so that I can put my favorite options at the top of the menu.	If a user has a dropdown menu with many options, it can save a lot of time when the user can put the most chosen options at the top of the dropdown menu.	https://github.com/home-assistant/frontend/issues/5149
H5	Show notification when settings saved	As an app user, I want to have a notification when my changes have been saved, so that I know when everything was saved successfully.	It is important to let the user know that actions performed have been carried out and saved correctly, so that there is no confusion later on.	https://github.com/home-assistant/frontend/issues/3562
H6	Allow stacked graphs for multiple solar production sources	As an energy manager, I want to have stacked graphs for multiple solar production sources in the energy module, so that I can see the aggregated production in a dashboard in one glance.	There are many bars showing up in a chart if the stacked graph is not allowed, which decreases the usability of the graph.	https://community.home-assistant.io/t/allow-stacked-graphs-for-multiple-solar-production-sources/327412
H7	Option to hide "min/max" legends in the statistics graph	As an app user, I want to hide the statistics legends in the statistics graph, so that the statistics legend does not overshadow the graph.	The statistics legend can in some cases become extremely big, thereby overshadowing the graph itself.	https://community.home-assistant.io/t/option-to-hide-min-max-legends-in-the-statistics-graph/328440
H8	Add battery to energy dashboard	As an energy manager, I want to have battery information in the energy dashboard, so that I can see how much energy is left in the batteries.	As some users rely on batteries for their devices, showing the status of these batteries can be very useful	https://community.home-assistant.io/t/add-battery-to-energy-dasboard/327527
H9	Add a cost and total fields to the energy dashboard 'monitor individual devices'	As a device owner, I want to have the cost breakdown for individual devices, so that I can see how much it costs for an individual device to run.	The cost is now only shown for the energy usage trackers, but it might be useful to also have them for individual devices.	https://community.home-assistant.io/t/add-a-cost-and-total-fields-to-the-energy-dashboard-monitor-individual-devices/337142
H10	Allow gas consumption in l instead only m^3	As a device owner, I want to have the gas consumption of devices in liters, so that I can easily compare it to the volume of my device.	For users it might be useful to have energy consumption shown in an appropriate measurement scale.	https://community.home-assistant.io/t/allow-gas-consumption-in-l-instead-only-m/335642

E: Analysis - Tags sequence

This survey is made for our research project for the Software Production course given at Utrecht University. In our research, we are examining to what extent requirements documentation is used in open source software development. In this survey, we will ask you some questions about your experience with requirements documentation. With requirements we mean a software product feature or issue aimed at the users that is added during development. The results of the survey will be kept anonymous. Filling out the survey will take approximately five minutes. Thank you very much for your participation and for helping us out with our project. If you want to know more about our research, you can contact us at s.a.devries@students.uu.nl.

General questions

1. Please select whether you are a member of one of the following open source communities.
   (a) GIMP
   (b) OpenKM
   (c) Home Assistant
   (d) None
   (e) Other: ...
2. Do you make use of some sort of requirements documentation for adding features?
   (a) Always
   (b) Very often
   (c) Sometimes
   (d) Seldom
   (e) Never
3. Do you think making use of requirements documentation would help with software development?
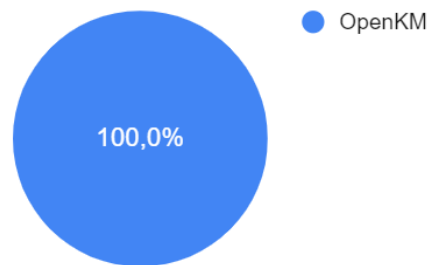   (a) Yes
   (b) No
   (c) Not sure

Requirements structures

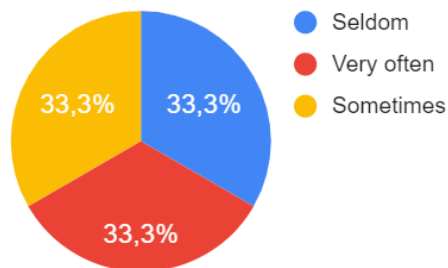Please select to what extent you think the requirement is of a good quality on a scale from 1 to 5.

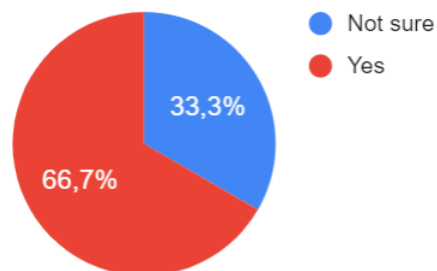| Requirement	really low quality	low quality	neutral	high quality	really high quality
1 Add a "Pixel Grid" option on the View menu.					
2 As a user, I want to have the toolbox and every non-functional dialog greyed out when no image is open, so that it is clear that these options cannot be selected.					
3 Allow stacked graphs for multiple solar production sources.					
4 As a user, I want to upload files by dragging and dropping, so that I can immediately upload multiple files.					
5 With no image open, the toolbox and every non-functional dialog shall be greyed out.					
6 As a user, I want to add stacked graphs for multiple solar sources in the energy module, so that I can see the aggregated production in a dashboard in one glance.					
7 As a user, I want to have an option for pixel grids in the view menu, so that I can immediately edit pixel art.					
8 Implement drag and drop to upload files,					

F: Survey answers

Please select whether you are a member of one of the following open source communities.

OpenKM

100,0%

Do you make use of some sort of requirements documentation for adding features?

- Seldom
- Very often
- Sometimes

33,3% 33,3%

33,3%

Do you think making use of requirements documentation would help with software development?

- Not sure
- Yes

33,3%

66,7%

Please select to what extent you think the requirement is of a good quality on a scale from 1 to 5.