



27th IEEE
International
Requirements
Engineering
Conference



UNIVERSITEIT TWENTE.

Developers' Eyes on the Changes of Apps: An Exploratory Study on App Changelogs

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2019-09-24

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Outline

- ▶ Motivation
- ▶ Research Design
 - ▶ Research Objective
 - ▶ Research Questions
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- ▶ Results
- ▶ Discussion
- ▶ Conclusions and future work

Motivation (1/2)

- ▶ The number of either new apps or new releases of existing apps are continuously growing
 - ▶ to satisfy the emerging demands of users
 - ▶ to be the winner in the market competition
- ▶ App changelogs are posted by software vendors or developers regularly in weeks or months.
 - ▶ the data source to get a comprehensive understanding on **the trend of apps development** and **developers' concerns on release planning** of apps

Motivation (2/2)

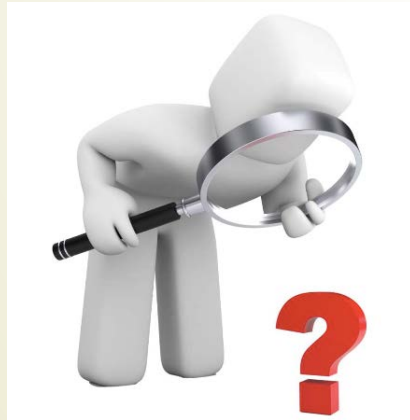
- ▶ Existing work of using app changelogs
 - ▶ To help identify emerging issues in app reviews [Gao et al., 2017]
 - ▶ To help confirm whether they provided useful information about the rationale for the emerging updates [Hassan et al., 2017]
- ▶ Our work: using app changelogs
 - ▶ To investigate the changes of apps as related to requirement types, from a developers' perspective.

Research objective

- ▶ **Our objective:** To understand which type of requirements (FR and/or NFR) get more attention from developers when posting the changelogs, in order to make the app more attractive to users.

Research Questions

- ▶ **RQ1:** Which type of requirements (FR vs. NFRs) dominate the changes of apps, according to app changelogs?
- ▶ **RQ2:** Which types of NFRs are the foci of app updates, from a developers' perspective?



FR ?

NFR?

Usability?

Reliability?

.....

Research Data (from Apple AppStore)

Category of apps	No. of apps	No. of app changelogs	No. of app changes	
			Before exclusion	After exclusion
Social Networking	40	3631	6469	2652
Travel	50	3166	6494	3207
Books	30	1850	4061	2178
Total:	120	8647	17024	8037

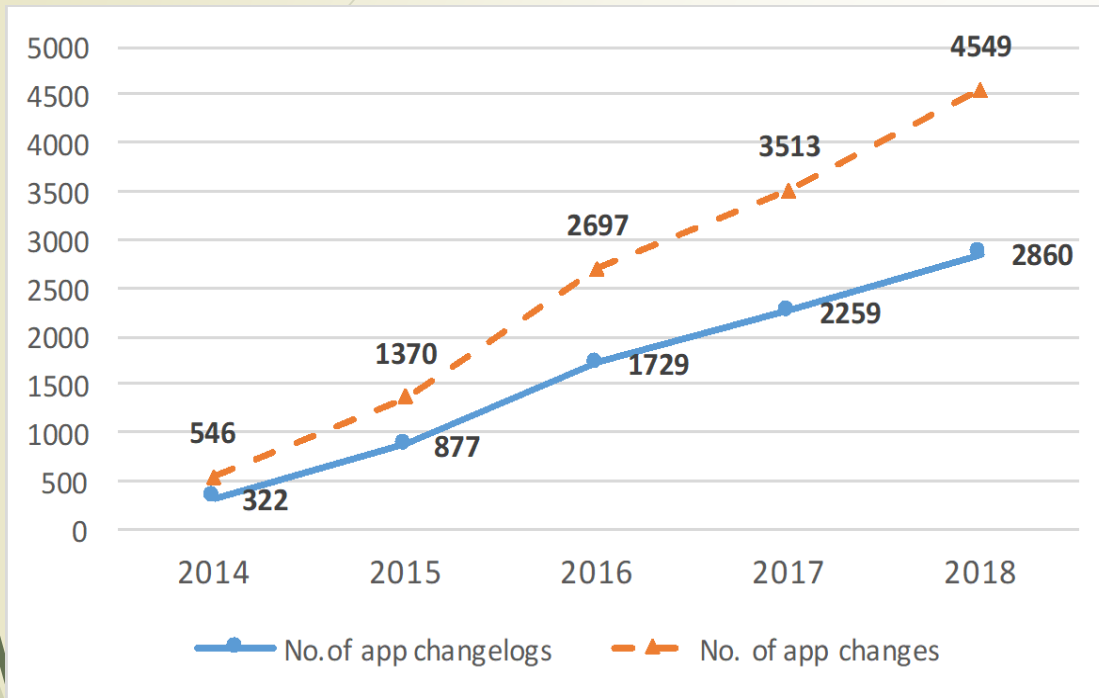
Data for manual labelling

3000 out of the 8037
(1000 changes × 3 categories)

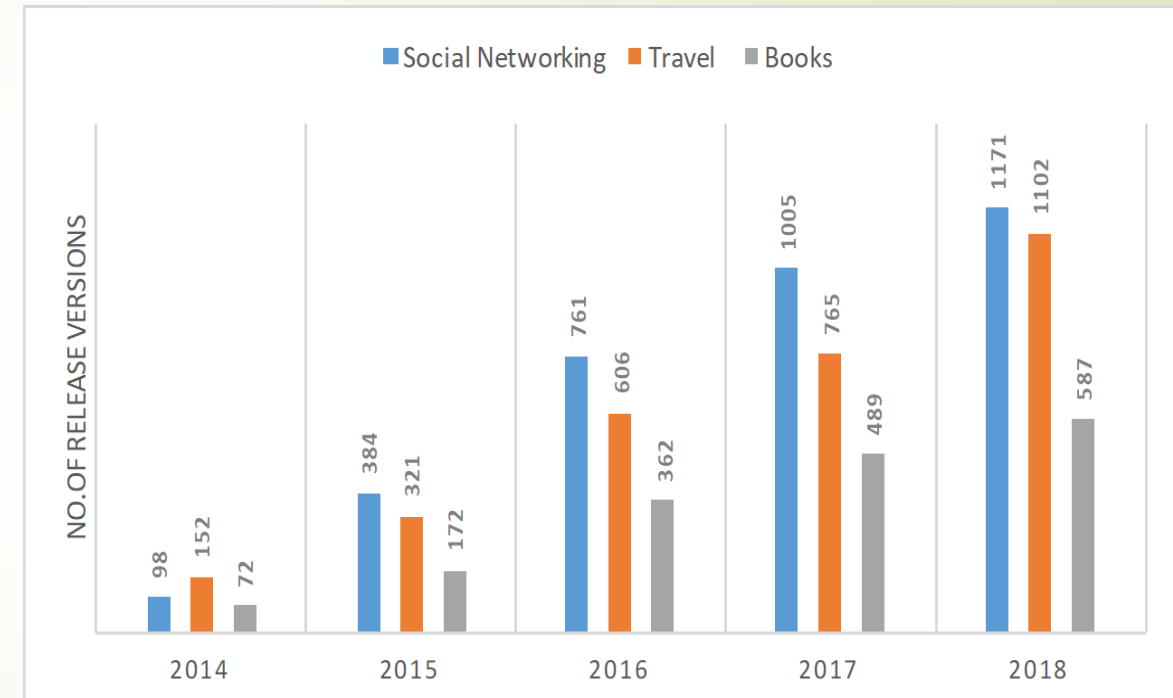
ISO 25010

Type of requirements	Examples of app changes
Usability	<i>Read magazines in a more friendly interface format.</i>
Reliability	<i>Email notification works again.</i>
Maintainability	<i>Unlocking picture is fixed.</i>
Performance	<i>Establishing video session takes less time.</i>
Portability	<i>Support for 3D Touch on iPhone 6 and 6s.</i>
FR	<i>We have added a password function; you can set a password to enter the program.</i>
Others	<i>Thank you for your use, please continue to pay attention.</i>

Results - Overview

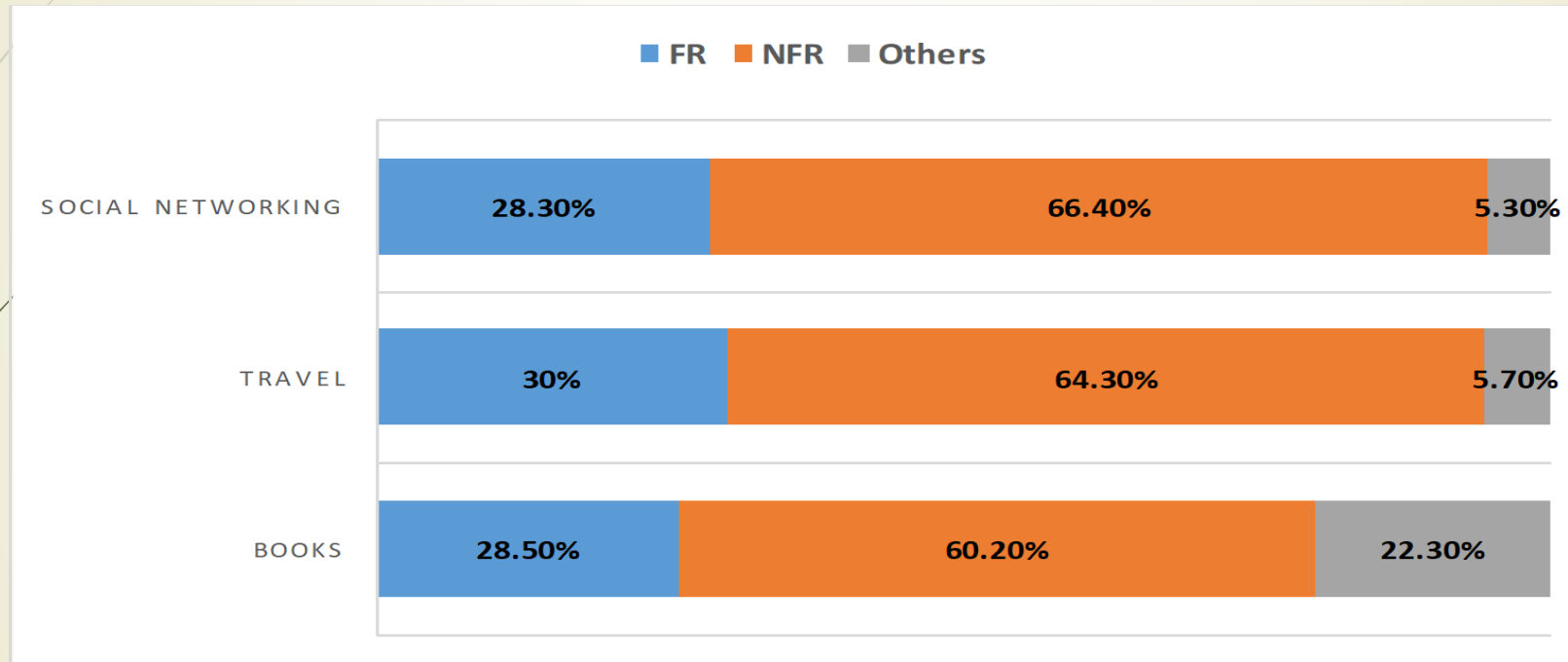


Growth of app changelogs and app changes over year.



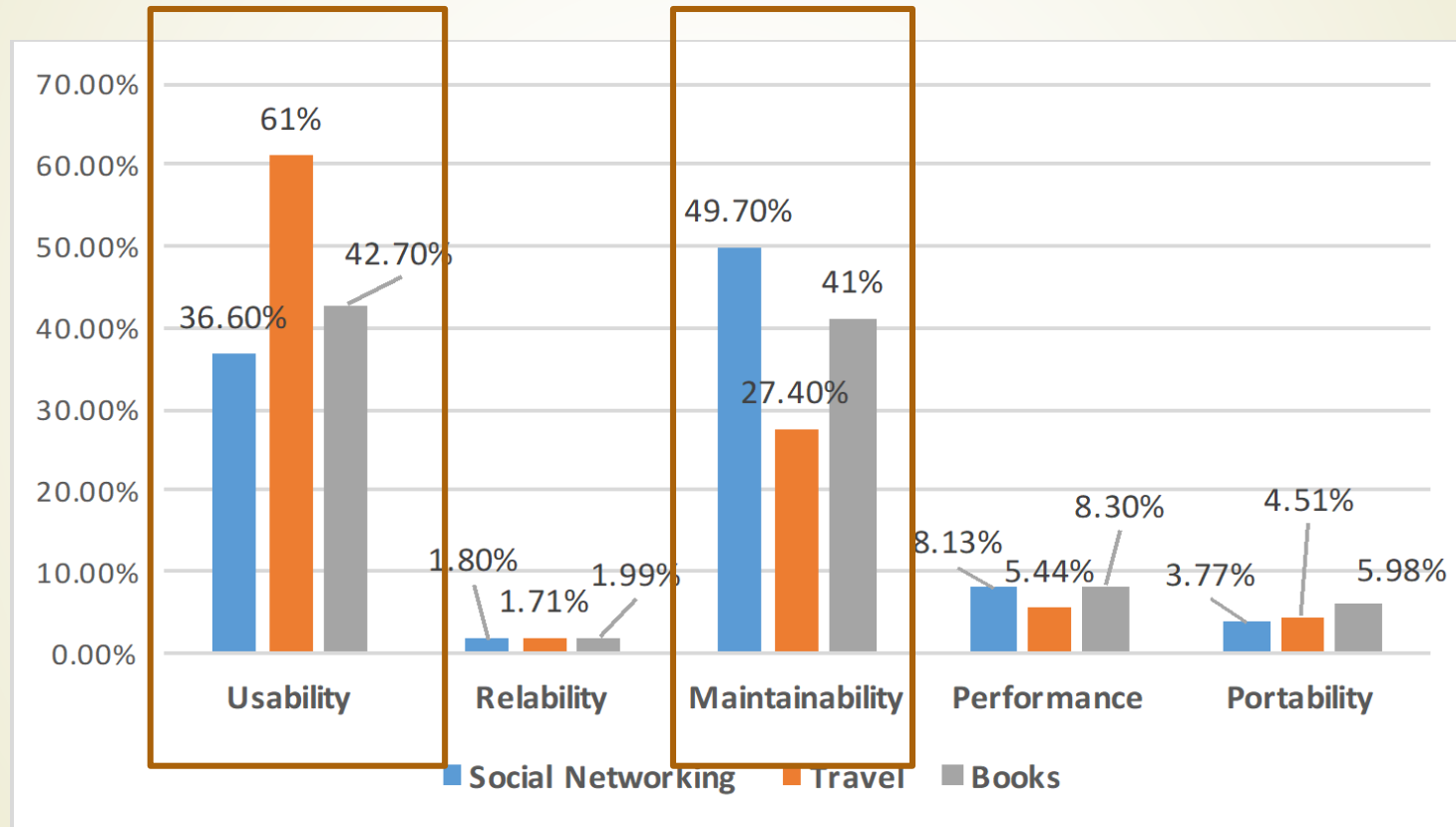
Numbers of app changelogs over categories of apps

Results – FR vs. NFR



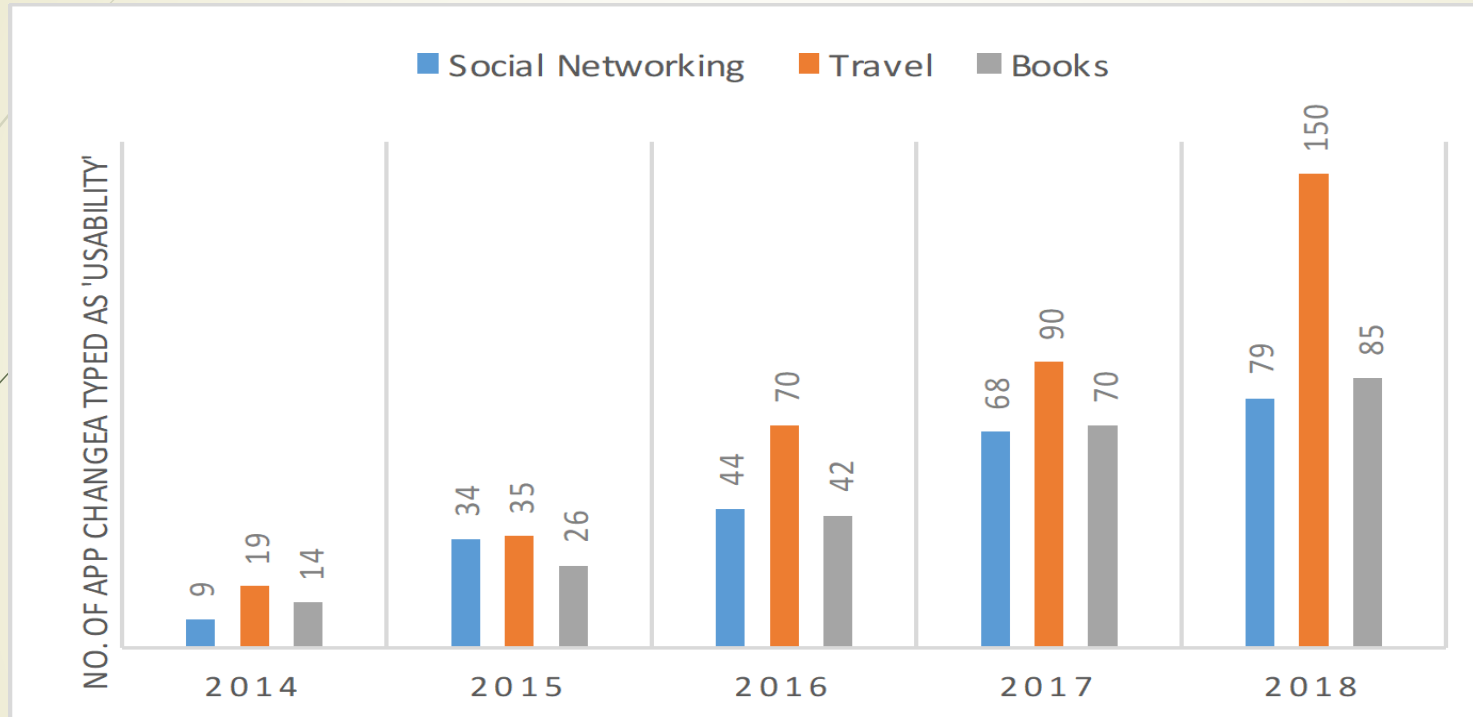
- 3000 = 868 (FR) + **1909 (NFRs)** + 223 (Others)
- NFRs got the most attention in the 'Social Networking' apps

Results – Five NFRs (1/2)



Percentages of the five NFRs over categories of apps.

Results – Five NFRs (2/2)



- Apps for travelling continuously focused on the changes relevant to usability
- The interest is even growing much faster in 2018.

Discussion

- ▶ The updating of apps is more and more frequent with larger number of changes
 - ▶ Quick response to users: to maintain current users and attract potential users
- ▶ FRs and NFRs dominate the changes of apps.
- ▶ The number of NFR-typed app changes (1909) is more than doubled the number of FR-typed app changes (868).
 - ▶ Developers focus much more on **how to improve user experience**
- ▶ Usability and Maintainability are the top two NFRs mentioned in app changelogs.
 - ▶ developers prefer to satisfy the users' needs and resolve their problems when using the apps.

Conclusions

- ▶ The majority of the changes in fact refer to NFRs.
 - ▶ Developers seem to be busy with improving the quality aspects of their apps, and relative fewer changes referred to FR.
- ▶ Usability and maintainability seem to be the NFRs that dominate the app changes

Future work

- ▶ To use machine learning techniques to facilitate the automatic classification of app changes
 - ▶ Comparison on the performance of traditional supervised machine learning algorithms (Done by Weka, RandomForest outperformed the others.)
 - ▶ Comparison on the time cost of manual and automated labelling and classification. (Almost done)
- ▶ To collect more app changelogs from more apps in 'Social Networking' and 'Books' category
 - ▶ In order to balance the percentage of app changes in different app categories in the research data (just started)



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Thank you!

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