

Quality Attribute Prioritization

Stakeholders

Stakeholder	Description	Elicitation Activity
Young Adult A	Physics student with tight-knit, large family. <ul style="list-style-type: none"> ● Age: 23 ● Gender: Female ● Race: South Asian ● Location: Waterloo, ON ● Education: Completing a Bachelor of Science (Physics) 	Participated in quality requirements interviews (both 100-Dollar and Kano Prioritization)
Young Adult B	University student with separated parents and a brother. <ul style="list-style-type: none"> ● Age: 21 ● Gender: Female ● Race: East Asian ● Location: Vancouver, BC ● Education: Completing a Bachelor of Kinesiology ● Often volunteers and works part-time jobs while studying 	Participated in quality requirements interviews (both 100-Dollar and Kano Prioritization)
Young Adult C	University student currently on an internship. <ul style="list-style-type: none"> ● Age: 21 ● Gender: Male ● Race: East Asian ● Location: Montreal, QC ● Education: Completing a Bachelor of Applied Science (Engineering) ● Filmmaking and transit are his hobbies 	Participated in quality requirements interviews (both 100-Dollar and Kano Prioritization)

Stakeholder	Description	Elicitation Activity
Young Adult D	University student with working parents <ul style="list-style-type: none"> ● Age: 21 ● Gender: Female ● Race: East Asian ● Location: Oakville, ON ● Education: Completing a Bachelor of Mathematics ● Has a full-time co-op position at the University of Waterloo which requires her to commute once a week 	Participated in quality requirements interviews (both 100-Dollar and Kano Prioritization)
Busy Parent A	Mother of two sons. <ul style="list-style-type: none"> ● Age: 50 ● Gender: Female ● Race: East Asian ● Location: North York ● Education: Nursing ● Working as a nurse at a senior home 	Participated in quality requirements interviews (both 100-Dollar and Kano Prioritization)

Quality Attributes

Category: Security

- *Measurement:* Number of reports of accounts being breached per month.

It is important that family data, such as schedules, are stored securely on our servers and are private to the family members. To quantify this, the number of reported security breaches is a good start in determining the effectiveness of our security protocols. A low number of reports indicate these mechanisms are working appropriately while a high number of reports may indicate that more adequate security solutions need to be implemented.

Category: Usability

- *Measurement:* Percentage of users who find our system easy to use.

Since our target demographic ranges quite vastly in age, the tech-savviness of our users is not guaranteed. As a result, we need to be proactive in ensuring our interface is easy to use and not overcomplicate the lives of the families using our system. As a means of measuring this attribute, the percentage of users who feel our interface is easy to use is used.

Category: Performance

- *Measurement:* Time it takes to open a poll for the 'plan a family activity' task on our platform (in seconds).

Tasks should take seconds to complete. If the execution time of these processes takes several minutes, this would strain the load on our system and result in poor user interactions. Given that our most important use case according to Kano prioritizations is 'plan a family activity', the best method of measuring this attribute would be the execution time of completing an action in this task's workflow in seconds. Users were asked to estimate the execution time of opening a poll to plan a family activity.

Category: Reliability

- *Measurement:* Ratio of downtime to running time should not exceed a certain threshold (in minutes).

The ability for family members to get a hold of each other is critical. Moreover, our system being down for too long disrupts the family's day-to-day dynamic. To better quantify this downtime, we can express it as a ratio between the system's downtime, and the system's up and running time. As long as this ratio does not exceed a certain threshold, in minutes, it would be a good indicator of the health of our system.

Category: Robustness

- *Measurement:* Percentage of errors handled successfully by the system.

Given that there exist users who are not as tech-savvy as others, all error and failure cases should be handled gracefully. Our thoroughness in the exception handling of our system also aids in the ease of usage of our platform as a whole. Therefore, it is reasonable to measure this attribute in terms of the coverage of these failure cases. The percentage of error and failure cases handled successfully by the system is a good indicator of whether or not more breadth is required in our exception handling mechanisms.

Category: Adaptability

- *Measurement:* How soon, after an adjacent system releases a large, core update (unrelated to a bug) to their platform, will we be able to update ours (in days).

Our system relies on several other adjacent systems to function as expected and cover all our intended use cases. The integration with outside actors, such as social media services, require frequent maintenance and updates. The flexibility required to complete these changes and updates is very high. Thus, the number of days needed to perform these updates is critical for our operations. The risk of failure to meet this requirement lies in the size of the adjacent system's update and the purpose of the update. As a result, we have specified the size of the update as large, and specified that the update must be a new release rather than a fix patched for a bug.

100-Dollar Prioritization

	Scores					
Requirement	Young Adult A	Young Adult B	Young Adult C	Young Adult D	Busy Parent A	Sum
Security	10	20	22	20	20	92
Usability	25	25	19	30	25	124
Performance	50	20	19	30	25	144
Reliability	5	15	13	10	10	53
Robustness	5	10	16	5	15	51
Adaptability	5	10	11	5	5	36

Summary of Results and Total Ordering:

As a result of the 100-Dollar prioritization activity, we were able to elicit the total priority ordering of quality attributes. The results were (1) Performance, (2) Usability and (3) Security. This was the priority ordering for all stakeholders across the board. For all five stakeholders for which the 100-Dollar prioritization activity was performed, their top three quality attributes were performance, usability and security.

Comment on Relative Priority:

Since it is clear that users overwhelmingly feel that performance, usability and security are important attributes, we can now discuss the relative priority ordering of these attributes. Young Adult A weighed the remaining three qualities, reliability, robustness and adaptability the lowest among all stakeholders with a value of \$5 for each. Other stakeholders were not too far off from this mark with scores of about \$10±5 for each of the remaining qualities. When it came to the top three quality attributes, Young Adult A placed the most value in the performance attribute, allocating \$50. The remaining four stakeholders each allocated approximately \$20-\$30 to each to the performance, usability and security attributes respectively.

The reason why stakeholders may feel these qualities were not as important as performance, usability and security is because these qualities are less user-centric in comparison. For instance, adaptability may be a quality that is more business-focused as stakeholders may not have a great idea of how software maintainability works in relation to adjacent systems.

Rich Fit Criteria

Rich Fit Table (combined results)

Requirement	Outstanding (Average)	Outstanding (Standard Deviation)	Target (Average)	Target (Standard Deviation)	Minimum (Average)	Minimum (Standard Deviation)
Security	0	0	1.8	1.789	3.8	3.493
Usability	98%	4.472%	84%	6.519%	71%	11.402%
Performance	0.94s	0.627s	2s	1.732s	4.2s	1.643s
Reliability	-	-	-	-	-	-
Robustness	-	-	-	-	-	-
Adaptability	-	-	-	-	-	-

The above consolidated results highlight the average and standard deviation of all interviewees' rich fit criteria. Coincidentally, all five stakeholders interviewed had the same priority ordering, with security, usability and performance being the top three attributes as per the 100-Dollar prioritization activity. Hence, there is no available data for reliability, robustness and adaptability attributes. Perhaps a larger sample size would more accurately depict the priorities of these latter three attributes.

Based on the standard deviations for performance and security measurements, our findings appear to be fairly accurate. The deviations for these attributes lay within an acceptable threshold (i.e. $\pm 2s$ and $\pm 1s$ for performance). This is because a standard deviation that is small indicates that the data lies close to the mean. Ideally, data that is within ± 2 standard deviations is considered to be closer to the true value of that measurement. The standard deviations calculated for usability measurements appear to vary the most with the highest deviation being about $\pm 11\%$ from the mean. This could imply that further interviews are necessary to obtain more precise results.

Rich Fit Criterias

Young Adult A			
Requirement	Outstanding	Target	Minimum
Security	0	5	10
Usability	100%	80%	65%
Performance	2s	5s	6s

Young Adult B			
Requirement	Outstanding	Target	Minimum
Security	0	1	2
Usability	100%	85%	70%
Performance	1s	2s	5s

Young Adult C			
Requirement	Outstanding	Target	Minimum
Security	0	1	2
Usability	90%	80%	70%
Performance	0.7s	1s	2s

Young Adult D			
Requirement	Outstanding	Target	Minimum
Security	0	1	2
Usability	100%	80%	60%
Performance	0.5s	1s	3s

Busy Parent A			
Requirement	Outstanding	Target	Minimum
Security	0	1	3
Usability	100%	95%	90%
Performance	0.5s	1s	5s