

Appendix A. Maximum Priority Index

The Priority Index (PI) is given by: $PI_j = I_j \prod_{k=1}^K (w_k f_k)^{c_{jk}}$, where I_j is the Fisher's information of item model j at the relevant θ , w_k is the weight associated with k th constraint, and f_k is the scaled quota left of constraint k . c_{jk} is the element in the j th row and k th column of the constraint relevancy matrix C . $c_{jk} = 1$ means constraint k is relevant to item model j , and $c_{jk} = 0$ means constraint k is irrelevant to item model j . For the scaled quota left f_k , if the k th constraint is a content constraint, then $f_k = (X_k - x_k)/X_k$, where X_k is the total number of item models from a certain content area, and x_k indicates that so far, x_k such item models have been selected. If the k th constraint is an exposure rate constraint, then $f_k = (r - (n/N))/r$, where r is the pre-set maximum value of an acceptable exposure rate, n is the number of the examinees who have seen instances from item model j , and N is the number of the examinees who have taken the test. The maximum exposure rate of an item model is constrained to be no greater than 20%, and the constructed individualized tests are constrained to have an equal number of items from each content domain.

Cheng, Y., & Chang, H. H. (2009). The maximum priority index method for severely constrained item selection in computerized adaptive testing. *British Journal of Mathematical and Statistical Psychology*, 62(2), 369-383.