

Why a QWERTY keyboard?

If you open a beer in the forest, does the light in your refrigerator at home go on?

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100 years ago, typewriters became a status symbol for senior executives. But, they had a habit of jamming when typists became proficient. In 1873, a man named Christopher Latham Sholes solved the jamming problem by re-arranging the keyboard layout to minimize jamming (upper layout in Figure 182)¹. The Sholes or QWERTY layout stresses the left hand, forces jumps to the top row and has very uneven finger loading. It was a “success” and became the standard. Studies of the QWERTY layout have shown that it is not tailored to the structure of any major earth language. Keys assigned randomly on the keyboard would be better then the QWERTY layout.

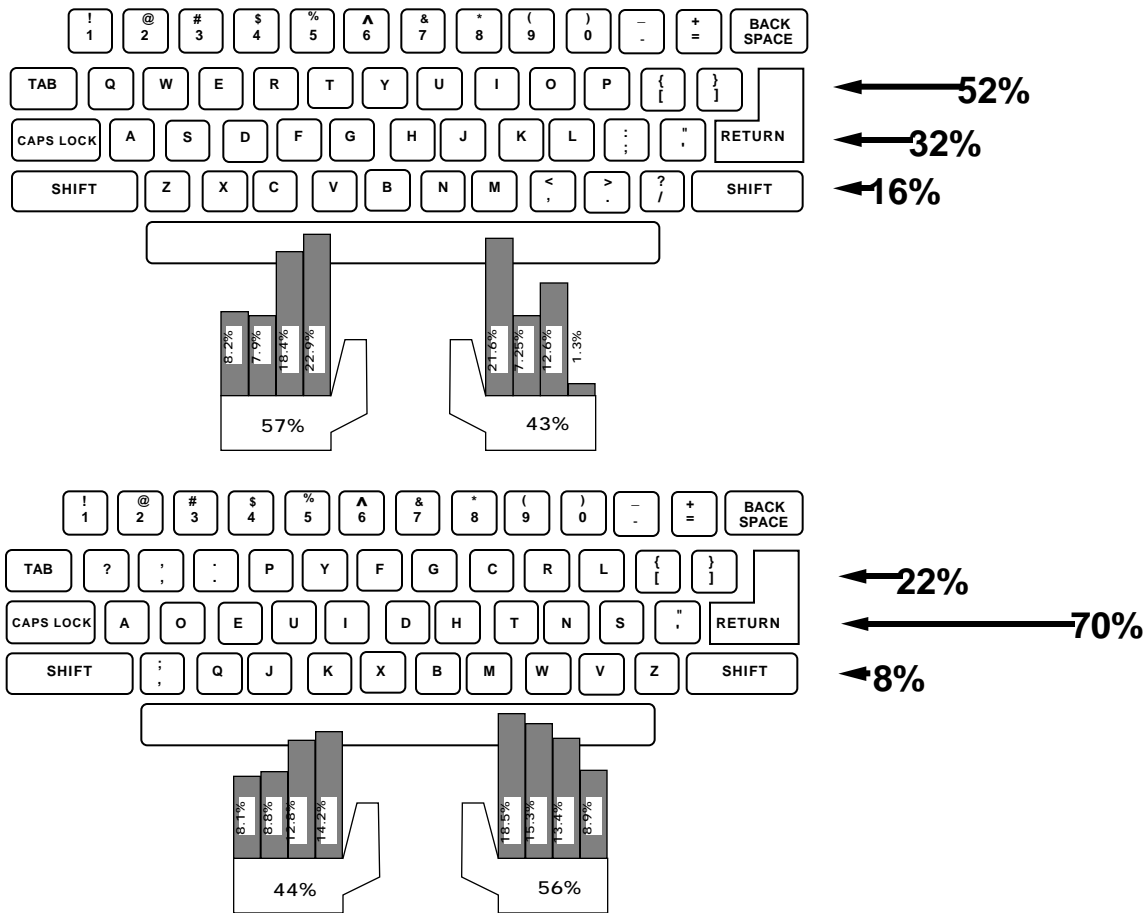


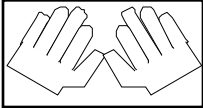
Figure 182: QWERTY and Dvorak keyboards.

The lower layout is the Dvorak layout, based on English usage, with all five vowels and the four most common consonants are on the home row, placed to maximize hand alternations. With this layout hand usage is balanced and most of the typing is done on the home row. There are other keyboards optimized for other languages, e.g. the Meier layout (not shown), is based on letter usage in German.

¹ Cassingham, R.C. (1986), *The Dvorak Keyboard*, Free-lance Communications, Arcata, CA., ISBN 0-935309-10-1 has the complete story about the keyboards developed by August Dvorak including some of the politics that kept it out of the U.S. Government.

Why a QWERTY keyboard?

Sit at a desk. Place your hands on the desk, palms down and bring your hands together. Notice that there is a considerable angle between your hands. A standard keyboard forces you to twist and remove that natural angle.



The Dvorak layout is available from many vendors, including IBM, but normally you are forced to use the Sholes layout to maintain compatibility with what people know and have. (The author uses a QWERTY in spite of knowing how much better Dvorak is.) The Sholes is inferior in all respects but, in spite of its limitation, there are design techniques that we can use to improve performance. For typing plain text, there is little you can do. In other cases, you may be able to control finger movement by selecting the letters to be typed and of keeping the amount of typing to a minimum. For example, commands, codes and abbreviations are under designer control and you can choose letters to optimize keyboard movement. Let us suppose that we are working on a system that requires a three letter command name. We can choose the letters. Let's look at the three letters used for the command to print boarding passes for standby passengers.

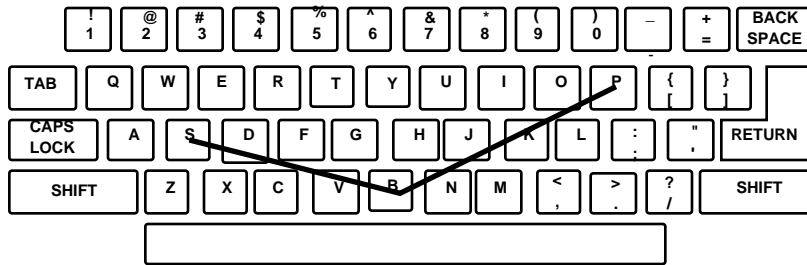


Figure 183: SBP

“Standby By Print” or **SBP** uses 2 keys left hand, no hand alternations, 2 keys not home row, awkward top bottom jump, little and ring fingers are used

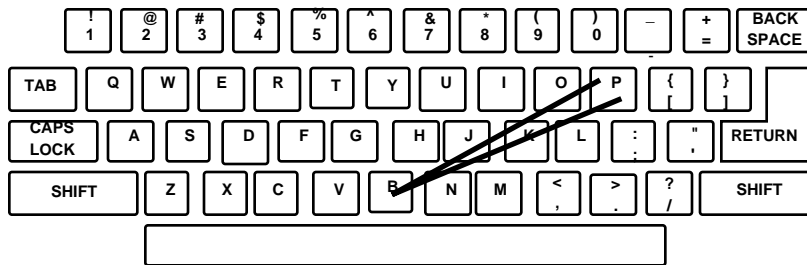


Figure 184: PBP

Print Boarding Pass: or **PBP** has 2 hand alternations, 3 keys not home row, 2 awkward top bottom jumps, and the ring finger is used.

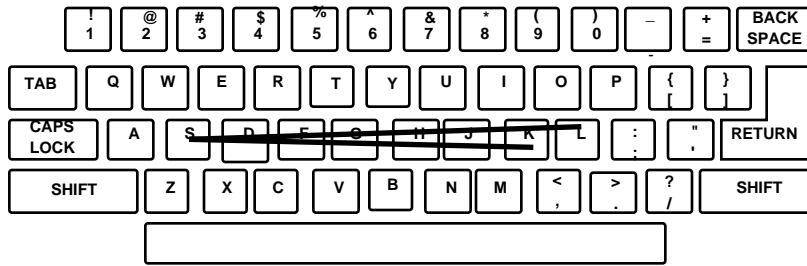


Figure 185: LSK

List Standby Kustomer: or **LSK** has 2 hand alternations, all keys on the home row, no awkward top bottom jumps, and the middle and ring finger are used.

Why a QWERTY keyboard?

LSK in Figure 185 seems better overall. For a very high volume transaction with a critical speed requirement it may be worthwhile to use an awkward mnemonic but improve speed.

Let's compare this to the data base query command listed below from Hammond and Barnard (1984).

```
*t<-<:s:age<20:>people
```

these mark shift key usage

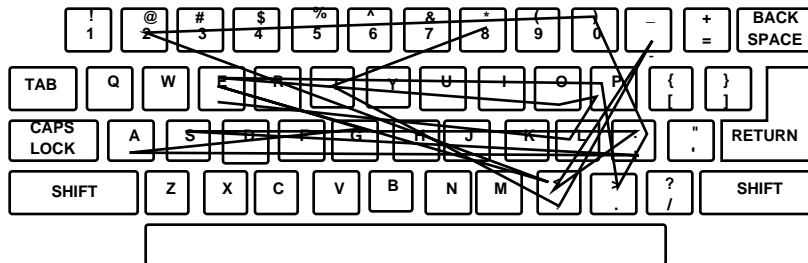


Figure 186: Keystrokes to enter a database query.

- 21 transitions between keys
- 8 require the shift key (marked with)
- 8 require jumps of two or more rows
- 1 hand alternations

Over half the errors observed use the correct key, but incorrect shift key. The user had thus constructed the correct command but the mechanics of entering it introduced errors. This was made all the more frustrating as the logic used to construct commands is reversed to the way people think. To ask the question “*What is the average age of the entries in people?*” the correct command is:

```
*t<-avg(people,age)
```

But this is really “*What is the average for entries in people of their ages?*” Putting arguments in an unnatural order will increase errors and this will be compounded if the shift key must be used with some of the characters.

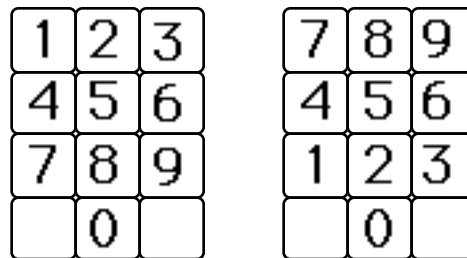


Figure 187: Numeric key pads

The telephone layout on the left is much preferred to the more common calculator layout on the right.

The numeric keypad layout used affects performance. Research has shown that the calculator layout was 13.7 percent slower and had a 22.8 percent higher error rate compared to the telephone layout, Conrad (1966).

Why a QWERTY keyboard?

Making the best of a QWERTY keyboard

Studies of typing speed and accuracy have given us the following principles of good keyboard design/usage.

Alternate hands

Data entry should have as many hand alternations as possible as the hand movements overlap and resulting in an average 23 percent improvement in speed.

Stay on the home row

Loading on the rows should be home row, top row and bottom row, in that order.

Use hands evenly

Loading should be about evenly divided between left and right hands. Any bias should be in favor of the right hand.

Avoid ring/little fingers

Minimal use should be made of the ring and little fingers.

Avoid difficult movements

Some finger movements are more difficult than others. Keying sequences requiring the consecutive use of the middle/ring or ring/little should be kept to a minimum. Avoid sequences that require the repeated use of one finger. Avoid wide and awkward spans of the fingers.

Avoid multiple key combinations involving the shift key

Multiple key combinations are more error prone and one of the most common entry errors is incorrect shift key usage.

Avoid jumps

Avoid jumps between the bottom and top rows.

Use the telephone numeric keypad layout

This is faster and more accurate than calculator layouts.