QWERTY KEYBOARD: A CASE STUDY ON THE IMPACT OF DE-FACTO STANDARDIZATION OF TECHNOLOGY

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ABSTRACT

We are currently living in a QWERTY culture where all the desktops, palmtops, mobile phones and all gadgets that enable texting use the QWERTY layout for keyboard. Why should the keys be arranged in this particular format? Why can't it be ABCD?What could be the history of formulation of this layout d design? Is thislayout design efficient enough in terms of typing speed, compatibility and user friendliness? These are certain questions that prompted to research on this area.

The layout as many of us know has been designed exclusively for the typewriters especially to disable jamming. But the modern computers and gadget that does not even need to compare its keyboard design with obsolete typewriters carry QWERTY design as a defacto standard. In fact the design actually reduces the typing the revealed. If an alternative could be suggested for QWERTY keyboard obviously it is DVORAK keyboards where the key positions are scientifically designed based on finger movements to enhance speed and accuracy. But Dvorak was unfortunately not popularized. The popularity and training given to QWERTY still make make it popular and comfortable for users that they don't even think of an alternative. Of course this leads to a Technology – marketing Gap in the industry too. Most of the companies like IBM, Intel etc still promote QWERTY as it is widely accepted by users and they do not prefer promoting an alternative efficient keyboard as far as the demand for QWERTY is consistent. The case study based on secondary data tries to reveal the impact of De facto standardization in society and market and also tries to create awareness on the possibilities of better technologies and alternatives in the secondary devices.

Key words: QWERTY, De-facto Standard, Dvorak Layout, Technology-Marketing Gap

Introduction

In this golden era of Information Technology and Telecommunication, the six alphabets Q-W-E-R-T-Y has knowingly or unknowingly become the part of Tech Culture..Inspite of all differences in technical parameters all modern gadgets including desktop computers, palmtops, tablets,iphones,all carry this unique keyboard design as a commonality and standard. Even the online services use this same design on their virtual keyboard. Although other keyboard layouts has shown their faces, this unique design could authorize its acceptance consistently for last 140 years! Whatcould be the reason for its popularity and monopoly? All the leading computer manufacturers and sellers across the world still strongly refer QWERTY even though they are really aware of all other alternatives? Is this layout design efficient enough in terms of typing speed, compatibility and user friendliness? Before confirming on these aspects we need to analyze the history of QWERTY, its origin, acceptance and sales.

History of QWERTY:

In 1874, when the first commercial typewriter was launched. Its keyboard layout was QWERTY (refer Exhibit 5), which was designed byChristopher Latham Scholeswith, James Densmore, Carlos Glidden and Samuel W. Soule. Christopher Scholes was an official of Milwaukee port and also a newspaper editor who developed the design for his business need. It was said to be designed in such a way that the commonly used alphabets such as "t" and "h" (and few other alphabets) were placed apart to prevent jamming of typewriters due to keypad clashes. Logically this would reduce the speed of typing but would prevent the typewriter jamming! This design was patented in 1868. Later Scholes came to an agreement with the popular precision machinery company Remington & Sons to manufacture and sell typewriters with QWERTY keyboards.US patent No 207559 was issued in 1878 for this keyboard layout.In this Civil War era the first ever commercial Typewriter with QWERTY key board was launched by Remington standardized this layout for all the 100000 typewriters produced across the country. In 1890 when the UnionTypewriter Company was formed by the merger of five largest typewriter manufacturers – Remington, Caligraph, Yost, Densmore and , Smith Premier they agreed to adopt QWERTY which gradually turned out to be a de facto standard. This was believed to be the history of QWERTY keyboards for a decade until a new dimension was bought in by Kyoto University Researchers Koichi Yasuoka and MotokoYasuoka..In the research done in 2011 they came out with an argument that QWERTY was not designed for Typewriters to reduce the mechanical error. They could never accept that an inventor would come up with a design that reduces efficiency to overcome a mechanical error. They argued that QWERTY was designed for the early adopters of typewriters, the telegraphers to conveniently type their Morse Code. And, this argument inspite of all research evidences made more logical sense.

The Kyoto Paper says:

"The code represents Z as '· · · ·' which is often confused with the diagram SE, more frequently-used than Z. Sometimes Morse receivers in United States cannot determine whether Z or SE is

applicable, especially in the first letter(s) of a word, before they receive following letters. Thus S ought to be placed near by both Z and E on the keyboard for Morse receivers to type them quickly (by the same reason C ought to be placed nearby IE. But, in fact, C was more often confused with"

Therefore the theory that, Scholes developed QWERTY to prevent jamming of keys was debunked.

Although Remington Company had a significant role in popularizing and marketing QWERTY typewriters, and also the theory of Morse Code resulting in its evolution, all seems to be rather insignificant for the 140 years of QWERTY's dominancy as the modern computers and gadgets doesn't have anything to do with keypad clashes or Morse Codes. Therefore the questions on De facto Standardization still remain significant.. Why should the keys be arranged in this particular format? Why can't it be ABCD? These questions can take us to explore some alternative keyboard designs and its comparison to QWERTY.

Other Keyboard Alternatives:

Dvorak Keyboard

The first alternative could the "**Dvorak**" Keyboard(refer Exhibit 1) which was designed in such a way that the finger movements could be optimized by reducing the distance between the frequently used keys while texting.This could enhance speed and accuracy. If QWERTY was named after the first six alphabets in the keyboard, "Dvorak" keyboard is named after its creator, August Dvorak, an educational Psychologist and Professor. He could identify the frequent typing error in QWERTY in the midst of the development of a thesis document and could realize the importance of a new keyboard design as it was a time emerging popularity of touch typing. He along with his brother William Dealey researched on English language, words, alphabets and the physiological movement of fingers during typing and finally developed a scientific design called "Dvorak".

The Advantages of Dvorak layout compared to QWERTY are:

- 60-70% of typing can be done in the home row(middle row) which is only 30-355 in QWERTY. This is because , in Dvorak, commonly used letters were placed in the home row which reduces finger movements
- In QWERTY, 56% typing is done with left hand which is not convenient for most users. In Dvorak all vowels and few consonants could be typed by left hand and all other consonants by the right hand, therefore it is equally distributed.
- Dvorak reduces the risk of carpel- tunnel syndrome or repetitive-stress injury (RSI). A user can type longer on Dvorak without making fingers sore.

There's also the fact that The Guinness Book of World Record's fastest typist—Barbara Blackburn—achieved her top speed on a Dvorak keyboard.

Compared to QWERTY "Dvorak" was easy to learn and wasaccurate in results. But one area where QWERTY still scores is the compatibility with different types of Operating Systems. The reason was that Dvorak was not popularized. But "Dvorak" got its patent in 1936 and ANSI (American National Standard Institute) accepted it as a standard keyboard for users. Now it is included in Windows, Apple Mac, Linux and BSD Operating Systems. If you can make a slight rearrangement in the control panel settings it's possible to switch from QWERTY to Dvorak keyboard.

KALQ

The venerable Max Planck Institute andUniversity of St Andrews,launched the KALQ keyboard (refer Exhibit 2)and was designed exclusively for tablets . The arrangement of alphabet is rescrambledsothat typing can be done using left and right thumbs with minimal movements.This reduces the strain of pressing caused by normal QWERTY arrangement.

T9 keyboard in mobile phones

Mobile phones incorporating the alphanumeric keyboard (also known as the T9 keypad, owing to the 3 x3 grid of keys) saw a phenomenal rate of adoption – an astronomical 5 billion people over 20 years.

The XPeRT Keyboard Solution: 2003

- XPeRT is a keyboardbuilt for faster typing and an easy transition from QWERTY.
- Hunt & Peck keyboard users can reach touch typing speeds with no special training.

The XPeRT Keyboard (refer Exhibit 3) moves only two high frequency letters, A + N (not six) and adds a second E key (the most commonletter at 13%). The change is easy to learn. It optimizes key sequences to be struck by opposite hands, the fastest way of typing. With these 3 elegant moves, the XPeRT keyboard goes from digraph disabled to speed enabled. Check out the Design Concepts or visit XPeRT Home.

Colemak

Colemak is incredibly close to QWERTY and only makes 17 changes to the key layout. This layout got rid of the CAPSLOCK key as it is rarely used. Like Dvorak, your fingers don't have to stretch as much with Colemak as they do with QWERTY, which supposedly makes typing faster and easier

Maltron

Maltron (refer Exhibit 4) is the most radical of the keyboard layouts. Instead of a group of keys in a rectangle, Maltron separates the keys on different sides of a number pad. Again, the keyboard is laid out by frequency of use so your hands don't have to move too often, and the keyboard is supposed to be more ergonomic than QWERTY

Apart from the above mentioned layouts there are slight variations of QWERTY itself such as QWERTZ which is also popular in certain foreign languages. Also referring to languages of different countries many customized keyboard layouts are also prevalent
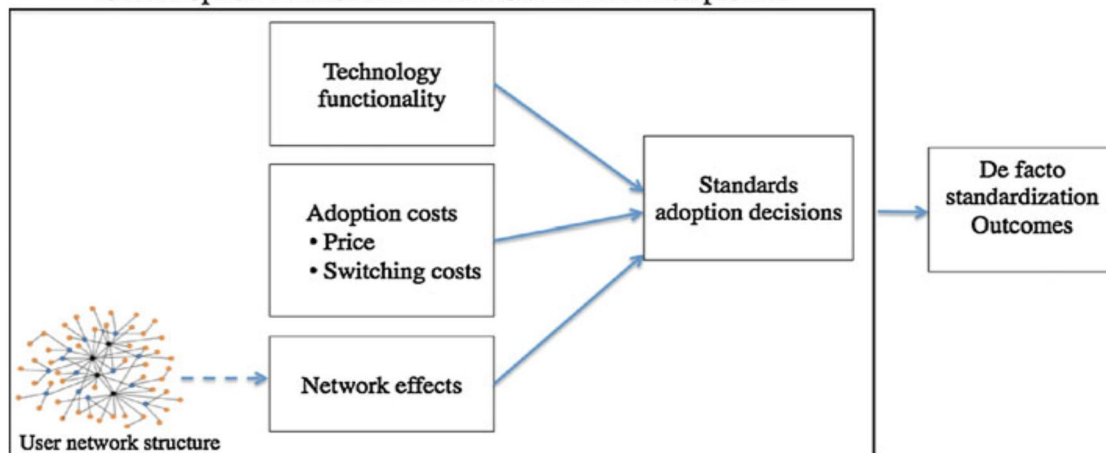
De-facto Standardization

In IT industry, de-facto standards emerge from standards competition as firms offer incompatible technologies and user choice determine the outcome of the competition. (Angsana A. Techatassanasoontorn,Shuguang Suo, 2011)

The de facto standardization is mostly resulted from the buyer's adoption decisions. When more people adopt a technology it creates a mindset that the technology could be worth adopting irrespective of its features or other alternatives available. A value is generated from the number of people who have already used that technology, which is referred as a positive feedback.

Apart from the QWERTY keyboard, the Microsoft Windows Operating System, High definition DVD, Blu Ray Disc are all examples of De facto Standards. But Microsoft Windows have gradually come out of this in the past few years. In today's technology market standard competition between incompatible products play an important role. According to economic theory of networks the factors taken into consideration for de- facto standardization through user adoption are:

- Influence of local network effects
- Switching costs
- Pricing strategies
- Functionality enhancement strategies
- User network structures

Source: Angsana A. Techatassanasoontorn •, Shuguang Suo, *Influences on standards adoption in de facto standardization,* Published online: 2 March 2011, Springer Science Business Media,

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When it comes to de facto standardization of QWERTY keyboard the Company Remington and its promotion played the major role. The huge sales resulted in higher rate of early adoption s and the non-availability of a competing layout resulted in better network effects among the potential users.

The likelihood of two technologies to coexist in a market significantly higher if vendors manage to maintain high switching costs. Besides, the dynamic price strategies can help a dominant firm to capture additional users in static small world as it can bring the market towards one winner take all the outcome. In this case the Switching cost of QWERTY to Dvorak is not very high, just marginal. Anybody with moderate computer skills can easily convert the layout with changes in control panel settings. When it comes to pricing strategies a Dvorak Keyboard is not sold or marketed by any IT firms as the demand of QWERTY is remaining consistent. The history says that during 1930s August Dvorak himself approached Remington to sell Dvorak Keyboards and as it was a period of Civil War, it was rejected by Remington. The functionality enhancement was done on QWERTY at the various stages of adoption to its transition to smartergadgets, mobile phones and virtual keyboards, in terms of number of keys used, shortcuts and also the physical appearances.

Why still QWERTY and not any other alternative?

A standard since 1870s, almost 140 years! This is a highly surprising fact even though many alternative keyboard layouts existed and most of them claimed to be efficient. Many studies done to prove the efficiency of Dvorak over QWERTY is not found to be successful. Although it was found to be faster in typing speed and useful for RSI, there were no researches to prove a significant difference in performance of Dvorak.

The Guinness Book of World Record's fastest typist—Barbara Blackburn, achieved herrecord using Dvorak keyboard. She accepts that it was not possible for her to achieve it with QWERTY. But the post Barbara records were won using QWERTY which again explains that it's the matter of training and not the layout that decides speed.

Another claim that it helps with RSI was effectively countered with the effective training on postures and hand positions while using QWERTY. Moreover the popularity due to standardization was very huge for QWERTY that evenif a person finds Dvorak or Colemak layout more efficient, he could use it in his personal computer or gadget only. For pair computing, group work or any external access forces him to use QWERTY again.Now the question could be whether alternative keyboards could be sold and popularized or not? Is there a market for these alternative layout for a Niche group, say for example the documentation professional? In such a case it generates a challenge to create a market for Dvorak or Colemak through awareness generation, which could seem rather risky and unpredictable in results. An empirical research is little in this area which does not provide a clear answer for the need of alternative and its acceptance. The media and online publications have already created a slight

awareness and a serious quest on alternate keyboard layout solution has begun. But so far any of the popular IT companies have taken up the sales and promotion of Dvorak, Colemak or XpeRT. May be there the uncertaintyof need and Return on Investment could e some of the reasons. But just like the Microsoft Windows OS which was a De facto Standard earlier is now being switched to other alternative OS , there could be further serious researches and thought in the area, as we shouldn't impose a technology at least to future generations which does not give a solid justification on standardization.

Conclusion:

The new the technology era is rapidly updated and quality conscious in terms of efficiency and effectiveness. This case tries imparting thoughts and discussions on a technology which is still a de facto standard. The study has a limitation of lack of any empirical data to substantiate and it is not possible to collect such information of 140 year old technology design. The case is derived from the secondary data especially online resources such as articles and media publications. The technology – marketing gap, and factors of e facto standardization if technology and possibility of a new market for alternative keyboard designs could key areas of discussions

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Appendix

Exhibit 1. Dvorak Simplified Keyboard

Exhibit 2: KALQ Keyboard

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Exhibit 3:XPeRT keyboard

X	P	E	R	T	Y	U	I	O	J
Q	S	D	F	N	H	A	E	L	K
Z	W	C	V	B	G	M	,	.	?

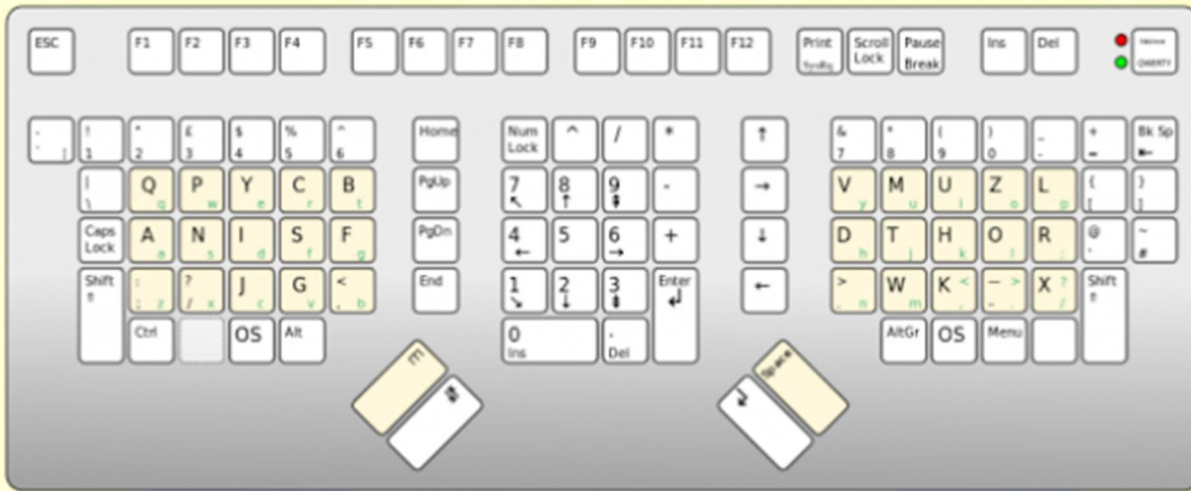Exhibit   4:   Maltron   Keyboard

Exhibit 5: The QWERTY Keyboard