

## Factors Influencing the Quality of Mobile Applications

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*Mobile applications are becoming increasingly used. Mobile devices are becoming indispensable for the user. In the material are claiming the sales of mobile devices internationally and the use of mobile applications compared to traditional internet use on desktop systems for the United States. Are presented influences the quality of mobile applications and based on these influencing factors built a model of choice for optimal application of mobile applications and traditional desktop application. At the end of the material presented methods to increase quality by tracking the influence factors during the development of mobile applications.*

**Keywords:** *Mobile Application, Quality, Influencing Factors, Model, Mobile Device*

### 1 Mobile applications

The mobile application is a set of coded instructions used by a mobile device to solve a problem. In [1], [2] the evolution of mobile

devices sales in 1992-2013 is presented. This evolution highlighting the manufacturer who sold the most devices in each is presented in Table 1.

**Table 1.** Annual sales by manufacturers (millions)

Year	NEC	Nokia	Motorola	Apple	Ericsson	Samsung	Siemens	Alcatel	LG	HTC	RIM
1992	4	3	-	-	-	-	-	-	-	-	-
1993	-	5	?	-	-	-	-	-	-	-	-
1994	-	9	12	-	-	-	-	-	-	-	-
1995	-	13	?	-	-	-	-	-	-	-	-
1996	-	18	?	-	-	-	-	-	-	-	-
1997	-	23	?	-	-	-	-	-	-	-	-
1998	-	39	34	-	26	5	-	-	-	-	-
1999	-	77	48	-	30	18	-	-	-	-	-
2000	-	127	61	-	42	21	27	-	-	-	-
2001	-	140	60	-	27	29	40	-	-	-	-
2002	9	152	73	-	24	42	35	12	14	-	-
2003	15	182	76	-	27	55	44	8	27	-	-
2004	-	208	105	-	-	86	49	-	43	-	1
2005	-	265	145	-	52	104	-	-	55	-	4
2006	-	500	210	-	74	117	24	-	62	-	-
2007	16	436	165	2.3	102	154	-	-	79	-	10
2008	-	475	108	12	95	202	-	-	104	-	25
2009	5	442	59	24	57	238	-	-	124	11	35
2010	-	463	39	42	42	282	-	33	117	25	48
2011	-	422	40	89	33	330	-	-	86	48	52
2012	-	335.6	-	135.8	-	396.5	-	-	55.9	32.6	-
2013	-	250.8	-	150.8	69	444.4	-	-	37.6	-	-

Figure 1 shows the architecture of a mobile application. The first action taken by the user in the application requires authentication. If the user is authenticated for the first time has no activated the account must be activated by setting the account user name, password, and

all the recognition and provisioning profile. After account activation user is redirected to the application menu. From this stage they can access their profile, and/or application modules.

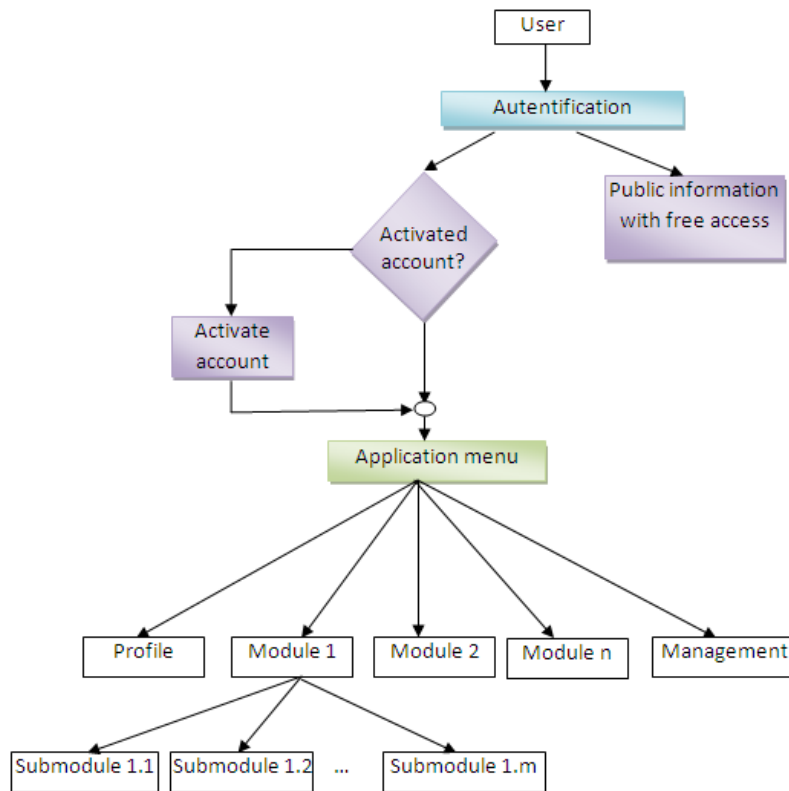


Fig. 1. Mobile application architecture

For each module and sub-modules are accessed hierarchically. If the user is an administrator in the application menu is available and management module for managing and administration of the application. According to [3] time a spent using mobile application has increased in comparison with

the time spent a traditional computer use. In January 2014 United States time spent in mobile applications has exceeded the time spent to access the internet on traditional computers. Thus it is found that mobile applications are a growing trend, Figure 2.

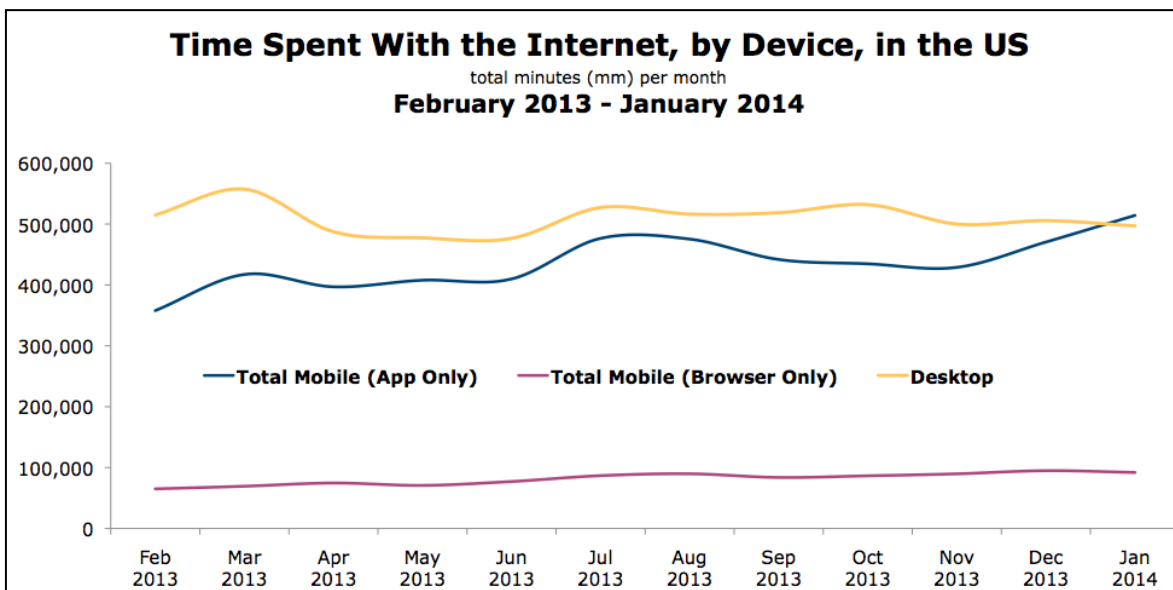


Fig. 2. Time spent on mobile applications [3]

These uses also reflect the quality of the applications used. As time spent on mobile applications increased, the quality of these applications must be increase too.

## 2. Factors of Influence

On the quality of mobile applications have a big influence factors acting on mobile applications and mobile devices.

Factors of influence are of two types:

- external application and present through indirect influence on the quality of the application;
- internal application pertaining to the application and how it was carried out by the developer.

External factors influencing the quality of mobile applications are:

- **the involvement of the developer level** in creating robust applications with a high level of quality; if the developer is not interested in the quality of the mobile applications created, they will not meet quality standards and have a low quality;
- **users expectations** for mobile applications, where the expectations are very high and the application does not meet their expectations, it is categorized as an application with low quality [5]; also where users have expectations and the application meets the minimum lot more user functions as expected, the application is seen as too complex, and many users will not use because of this complexity too high; so it is very important for the development of mobile applications to build highly targeted group and be taken into account during the development of the mobile application;
- **the distribution way** of the application is an important factor for the use of the mobile application because an application is not distributed properly not reach the users who need it to use; distribution is recommended to be done through specialized shops producers operating system for mobile devices such as *Google Play* for *Android* devices

and stores device manufacturers such as *Samsung Apps* for all devices from *Samsung* manufacturer;

- **battery life** is a factor that influences the time you can spend in the application user without having to recharge the battery of the mobile device; if the user is away on a trip and do not have the possibility to recharge the mobile device the application cannot be used;
- **RAM memory of the mobile device** influences the speed with which the application runs;
- **CPU processing power** of the unit of mobile device that run the mobile application;
- **memory on hard disk of the mobile device** is important for applications that work with large volumes of data and saved locally on the mobile device.

Internal factors influencing the quality of mobile applications are:

- **the source code** influence the application execution mode, if the code contains many repetitive instructions the application is a slow and consumes a lot of resources;
- **used technologies** for application development, if they are old technology cannot be run on mobile devices so new and fresh and the application will not be used by anyone [6], [7];
- **commands rapidity** has a very important role in determining the total time spent by user on the mobile application. So if speed is sufficiently high commands, the problem is solved in a short time and during interaction with the user application is reduced, which is not forced to interact with the application for a long time to solve the problem;
- **the information volume provided** is the amount of data and information displayed at one time on the mobile device via the; The small size of mobile devices brings great challenges in providing numerous user information. Must be borne in mind that if is provided

a lot of information on reduced screen sizes as this information end up not being read or understood by the user.

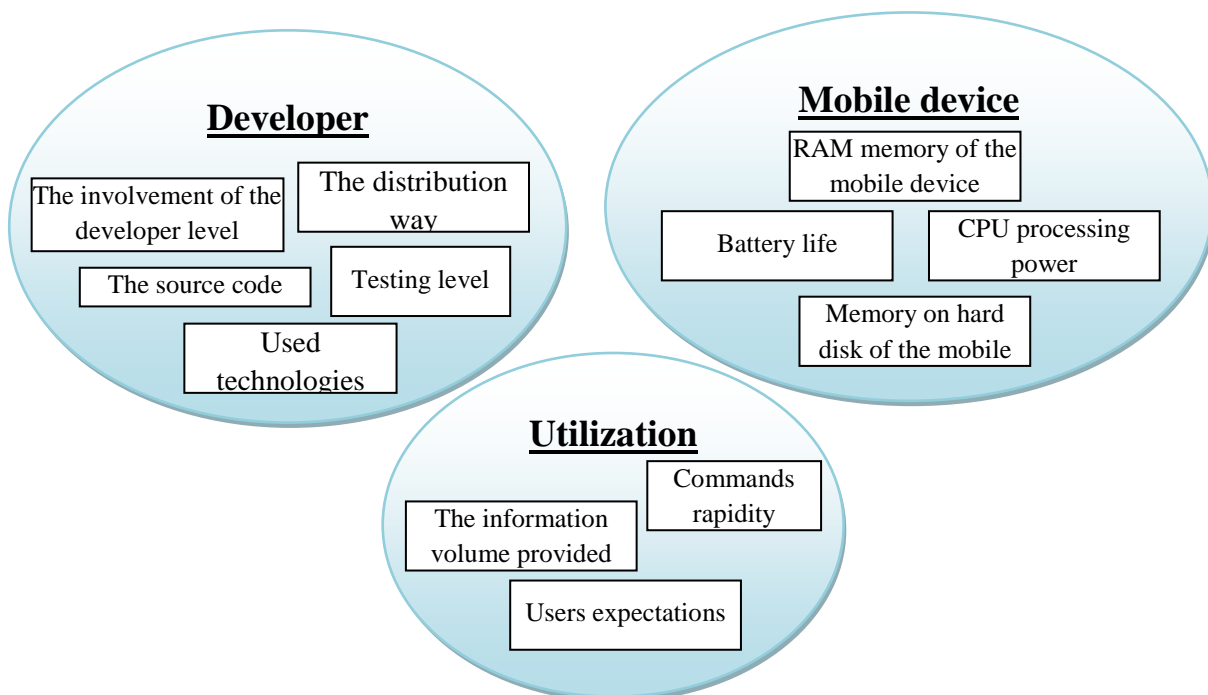
- **testing level** influence the future behavior of the application by processing incidents and resource requirements for

remedies. Testing is an important step in the process of software products [8], [9]. Each of the items has a greater influence on the quality and lower mobile applications and on their use.

**Table 2.** Influencing factors on mobile applications quality

Factor	Level of influence (low/high)
The involvement of the developer level	↓
Users expectations	↓
The distribution way	↑
Battery life	↑
RAM memory of the mobile device	↑
CPU processing power	↑
Memory on hard disk of the mobile device	↓
The source code	↑
Used technologies	↓
Commands rapidity	↑
The information volume provided	↓
Testing level	↑

Table 2 highlights the level of influence of each factor on mobile applications.



**Fig. 3.** Groups of influencing factors

Influences factors belong to three major categories. Influencing factors related to mobile application developer, influence factors related to the mobile device that is

run the application and its capabilities and influence factors related to the use of the mobile application. These groups are shown in Figure 3.

### 3 Mobile Application /Desktop Applications

For comparison of mobile applications with desktop applications, influence factors are

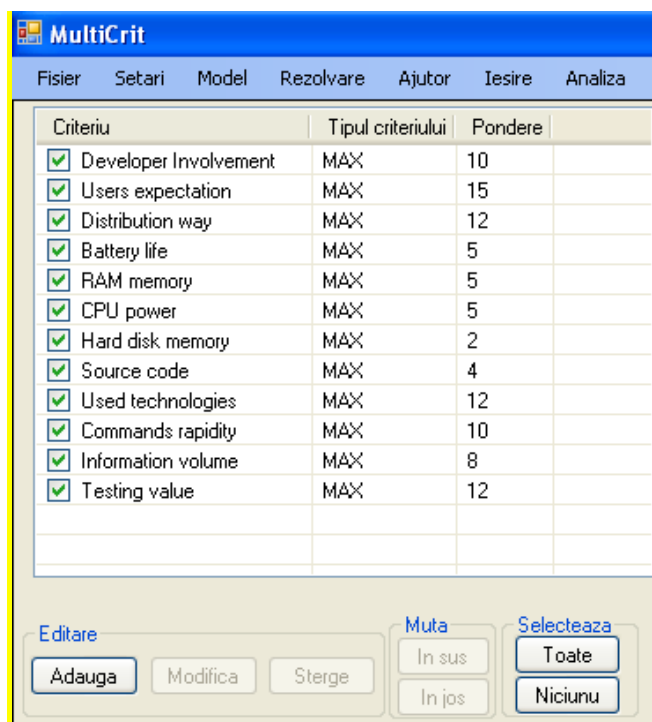
considered multi-criteria analysis criteria. Table 3 presents these criteria along with their type and weight set for each criterion.

**Table 3.** Model criteria

Factor	Type	Weight
The involvement of the developer level	max	0,1
Users expectations	max	0,15
The distribution way	max	0,12
Battery life	max	0,05
RAM memory of the mobile device	max	0,05
CPU processing power	max	0,05
Memory on hard disk of the mobile device	max	0,02
The source code	max	0,04
Used technologies	max	0,12
Commands rapidity	max	0,1
The information volume provided	max	0,08
Testing level	max	0,12

These values are entered in MultiCrit application for multi-criteria analysis of the two types of applications: mobile

applications and desktop applications. Figure 4 presents the window from MultiCrit application with all criteria included.



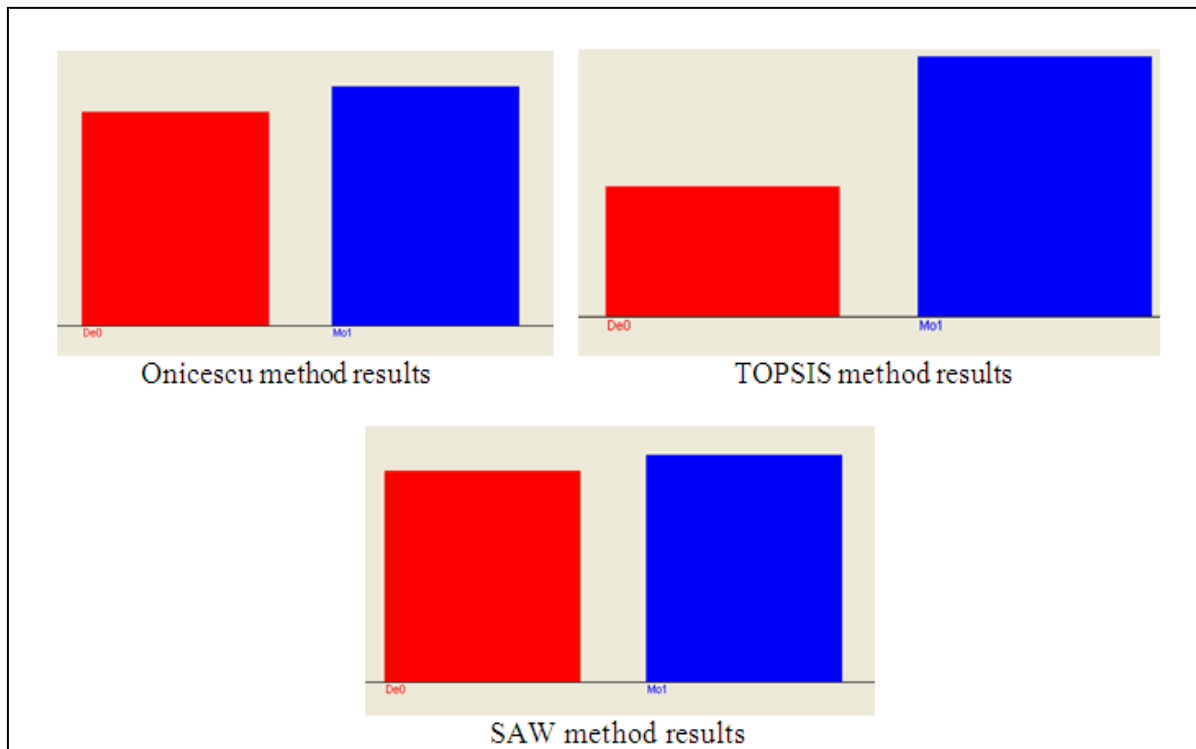
**Fig. 4.** Criteria entered in the MultiCrit application

To solve it builds model decision matrix for the two types of applications. This matrix is shown in Table 4.

**Table 4.** Decision matrix

Factor	Desktop applications	Mobile applications
The involvement of the developer level	9	9
Users expectations	8	10
The distribution way	3	5
Battery life	10	7
RAM memory of the mobile device	8	2
CPU processing power	8	4
Memory on hard disk of the mobile device	1000	100
The source code	1	1
Used technologies	0	1
Commands rapidity	8	9
The information volume provided	10	8
Testing level	7	9

Based on the decision matrix software MultiCrit create and solve the model with Onicescu method, TOPSIS method and SAW method- Simple Additive Weighting, the data and results are obtained out to be advantageous to use mobile applications at the expense of using desktop applications, Figure 5.



**Fig. 5.** Methods results

This demonstrates that increased use of mobile applications reaching soon to take longer than desktop applications. The time spent on mobile application is increased

because a mobile application is an optimal solution between mobile and desktop applications.

#### 4 Increasing the Quality of Mobile Applications

According to [4] when users find a website that does not meet his expectations or does not have a version for mobile devices no longer use it and do not recommend it to other persons, Figure 6.

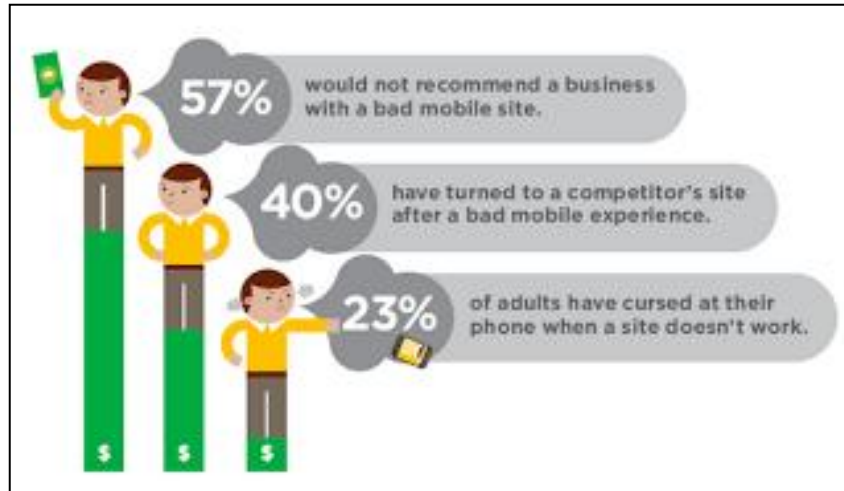


Fig. 6. Recommendation on web applications for mobile devices [4]

Such applications with high quality keeps customers loyal and they in turn recommend other persons application, increasing in this way the number of users. If the application has a low quality, users will never use nor recommend it to other people.

To increase the quality of mobile applications and their utilization among end-users have considered all factors influencing mobile applications. Ever since mobile application development should be followed to ensure the fulfillment of each feature and each influencing factor.

Similarly searching for quality assurance and tracking influence factors. Thus:

For the factor is achieved by surveys among users in the target group and seek implementation of the requirements and needs.

For the **distribution way** of the application to maximize the impact is recommended distribution through all available channels: both through specialist shops and through social networks or even be made a website where they can be downloaded. It is also recommended placing it in specialized shops because mobile devices are made with the default setting to not install applications from sources other than the manufacturer's shop.

Otherwise the user must modify these settings.

For all the influence factors related to **mobile device**, the only thing that can be done is that the description of the application to specify what devices is recommended, in this way for the devices which have battery life too short or low RAM or CPU processing power is reduced is not recommended to install that mobile application.

Influence factor represented by the source code is recommended as for readability feature that developers have a right to write proper code and mobile devices.

**Used technology** is recommended by current technology despite having trained for this application but the quality will increase their expense using obsolete technologies.

For **the information volume provided** mobile application developer must provide an adequate amount of information so that the user is satisfied with the information volume but also the presentation of this information.

#### 5 Conclusions

Mobile devices have evolved allowing their use for solving any kind of problem. Their power computing, both in terms of

processing power and available memory have greatly expanded. The availability of mobile operating systems has made application development process to be easy and thus led to a boom in mobile applications development. Important aspects are that the usage of mobile applications is increased a lot and exceeds the usage of desktop applications.

## References

- [1] [http://en.wikipedia.org/wiki/List\\_of\\_best-selling\\_mobile\\_phones](http://en.wikipedia.org/wiki/List_of_best-selling_mobile_phones)
- [2] A. Zamfiroiu, M.L. Despa, “Reasons, Circumstances and Innovative Trends in Mobile Environments”, *Informatica Economica*, vol. 17, nr. 2, 2013, pg 109-118, ISSN: 1453-1305;
- [3] <http://www.marketingcharts.com/wp/online/in-the-us-time-spent-with-mobile-apps-now-exceeds-the-desktop-web-41153/>
- [4] [http://adwords.blogspot.ro/2012\\_05\\_01\\_.html](http://adwords.blogspot.ro/2012_05_01_.html)
- [5] L. Arhippainen, M. Tähti, “Empirical Evaluation of User Experience in Two Adaptive Mobile Application Prototypes”, Proceedings of the 2nd International Conference on Mobile Idots (January 2003).
- [6] P. Pocatilu, C. Boja, C. Ciurea, “Syncing Mobile Applications with Cloud Storage Services”, *Informatica Economică*, Vol. 17, No. 2/2013, pp. 96-108.
- [7] M. Popa, “Considerations Regarding the Cross-Platform Mobile Application Development Process”, *Economy Informatics*, Vol. 13 No. 1/2013, pp. 64 – 72,
- [8] C. Boja, M. Doinea, P. Pocatilu, “Impact of the Security requirements on Mobile Applications Usability”, *Economy Informatics*, Vol. 13 No. 1/2013, pp. 64 – 72
- [9] I. Ivan, C. Ciurea, A. Zamfiroiu, M. Despa, C. Sboră, E. Herteliu, “Software Testing, Cybernetic Process”, *The Eighth International Conference on Economic Cybernetic Analysis: Development and Resources (DERS 2013)*, Bucharest, Romania, November 1-2, 2013, ISSN 2247-1820, ISSN-L 2247-1820.



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