ATLANTIS PRESS
Advances in Computer Science Research, volume 87
3rd International Conference on Mechatronics Engineering and Information Technology (ICMEIT 2019)

A Flat Management Platform based on Mobile Internet and Big Data

Bin Liu[1, a, *], Yunna Li[1, b], Jun Qi[1, c], Tao Feng[2, d], Yijie Yuan[1, e], Liang Si[1, f] and Liwei Yang[3, g]

[1] School of Economics and Management, Hebei University of Science and Technology, Shijiazhuang, Hebei 050018, China

[2] Hebei province expressway, Beijing-Qin management office, Qin Huangdao 066001, China

[3] Hebei province expressway, Zhang Cheng Chengde management office, Chengde 0670001, China

[a, *]tsingnlp@163.com, [b]liyn036@163.com, [c]qijun0065@163.com, [d]ft001@163.com,

[e] yuanyijie17@163.com, [f]siliangmail@163.com, [g] ylw001@163.com

Abstract. In hierarchical management systems, the information interaction problems often appear such as transmission delay, ununified understanding of important matters and distortion of the original intention. At present, many people are used to using Wechat and QQ to exchange daily work information. However, this may lead to the following problems: 1) in group discussions, the problem of multi-topic cross-cutting occurs, leading to confusion of discussion clues and divergence of the content of important topics; 2) relevant information and data cannot be independently saved and analyzed by the unit, which is helpful in mining guiding rules conducive to improving the business level of the unit; 3) important business information of the unit is leaked on the social platform. This article develops a flat management platform consists of a dedicated data acquisition front-end and a data analysis back-end relying on mobile Internet technology and big data technology, respectively. The platform has been used by Chengde section management office of Zhangcheng expressway for over two years, and its effectiveness and practicability has been proved.

Keywords: Flat Management; Mobile Internet; Big Data; Expressway.

1. Introduction

In a hierarchical management system, A grass-roots employee records the situation of his job site and reports to the grass-roots leadership, then the leadership sequentially summarizes and refines the report, and transfers it to the middle-level leader, who will also summarize and refine again, and finally to his senior leader (Sengupta, et al. 2018, Fourcade, 2018). This bottom-up information flow has the following characteristics: 1) the reports are mostly written on paper; 2) the reporting sequence among different roles is relatively fixed; 3) the reporting period between hierarchies is uncertain; 4) there may be multiple information exchanges between adjacent roles; 5) because people have different understandings, experiences and sensitivities, important information may be lost.

Almost all senior leaders want to know the important issues that happen in their units at the first time, but the inherent drawbacks of hierarchical management make it very hard, which reduces the management efficiency. To solve the above problems, a considerable number of units and individuals use WeChat (Liang, et al. 2017) and QQ (Li, et al. 2017) as the flat communication platforms, which have the characteristics shown in Fig.1. However, they are not suitable for the daily communication and management of government agencies, enterprises and institutions, because of the following points:

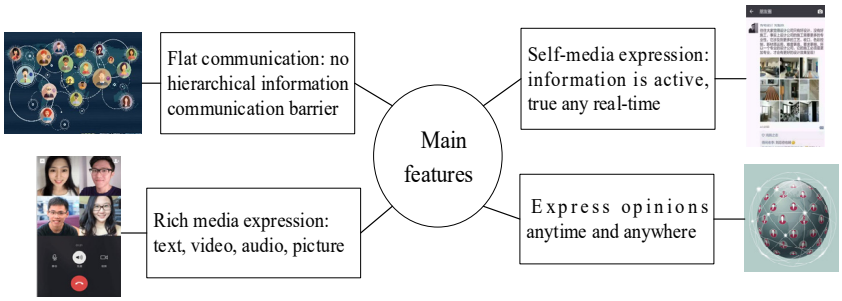


Figure 1. Main information interaction characters of WeChat and QQ.

WeChat and QQ are social platforms (Tiganoaia, et al. 2017, Hodson, et al. 2016, Misra, 2016) and not suitable for transferring the organization information, which is serious, formal and confidential (e.g., discussing the internal work, transmitting internal documents). Because of the objective existence of the risk of Internet security (Sun, et al. 2018), once the information is leaked out, it will cause a very passive situation for the organization and its leaders.

The information interchanged on WeChat and QQ, which should be the property of the unit, is stored on Tencent's servers. So, the data cannot should be used to help leaders to track tasks, monitor the situation and discern the whole situation. Nor can it be mined for decision-making (Saghari, et al. 2015).

For solving the above problems, we have developed a flat management platform supporting interchanged information self-owned and self-analysis, based on mobile internet (Yu, et al. 2014) and big data (Park, et al. 2015) technologies. In order to enhance the platform's pertinence and practicability, we consider the real needs from Chengde section management office of Zhangcheng expressway. In the following sections, the functional framework, technical architecture and implemention of this platform are introduced.

2. Platform Functional Framework & Technical Architecture

Figure 2 shows the functional framework including two parts: Dedicated App as the front-end and Management & Analysis as the back-end. The main function modules are information releasing, information acquisition, basic management and data analysis.

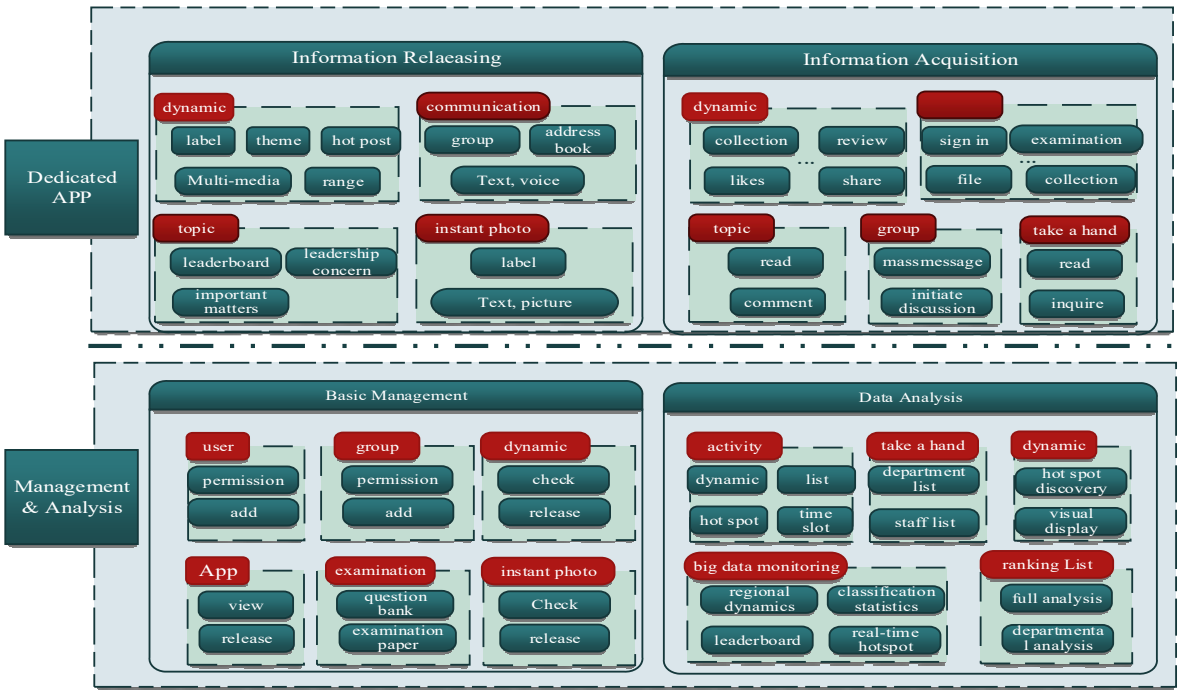


Figure 2. Functional framework of the flat management platform.

(1) Information releasing. This module helps to form thematic cohesion, high topic level, traceable events, tasks and requirements in the daily management process. It also can help information be expressed in a three-dimensional form, and reflect the "first scene" situation in the "first time", help all staff, departments and relevant persons to immediately capture information and make responses and decisions.

(2) Information acquisition. It is designed based on the idea that data is the core resource. The ultimate goal is to collect business information throug the flat management platform, provide data resources for data mining and improve the data-driven management capabilities.

(3) Basic management. It is designed to meet the basic management of personnel, groups, and dynamics.

(4) Data analysis. This module uses the technologies of statistics, time series mining, data visualization and GIS to analysis the data resources. It helps to form the decision support capability supporting situation monitoring, hot spot discovery and automatic ranking.

Figure 3 shows the technical architecture including three main parts: Dedicated App, Web Platform and Server Side.

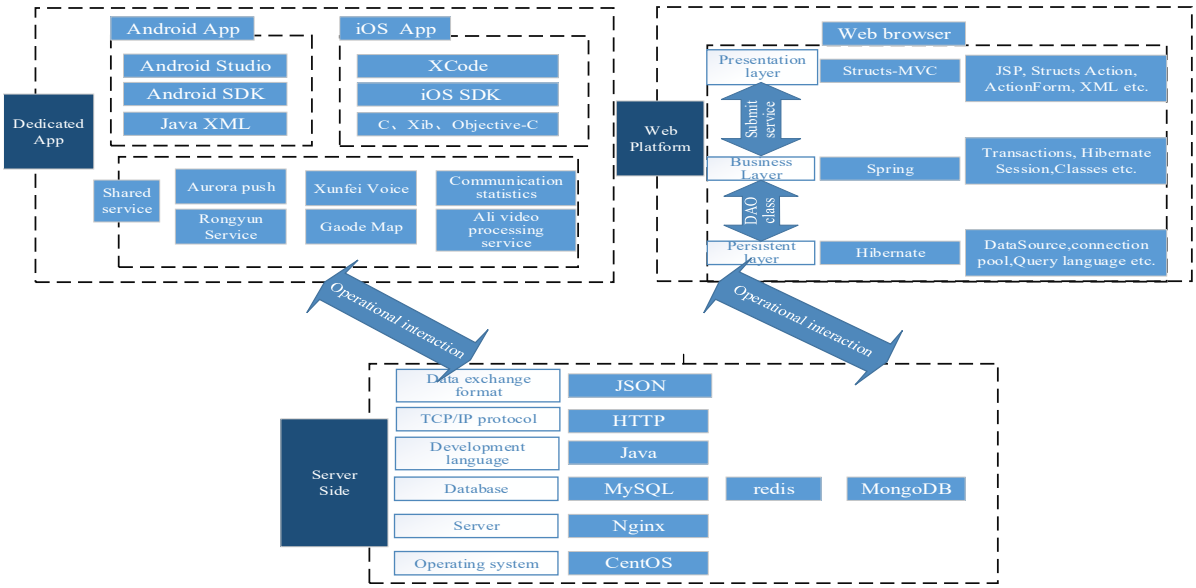
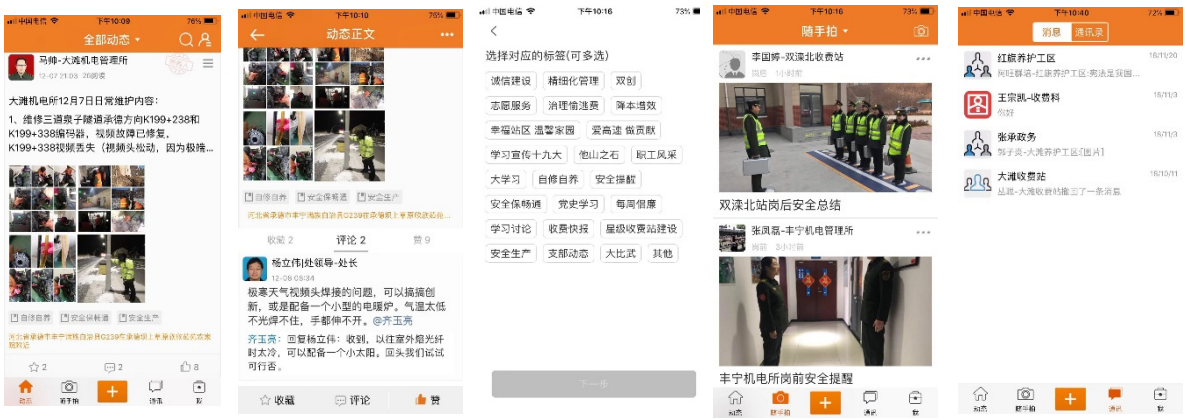


Figure 3. Technical framework of the flat management platform.

3. Platform Implementation

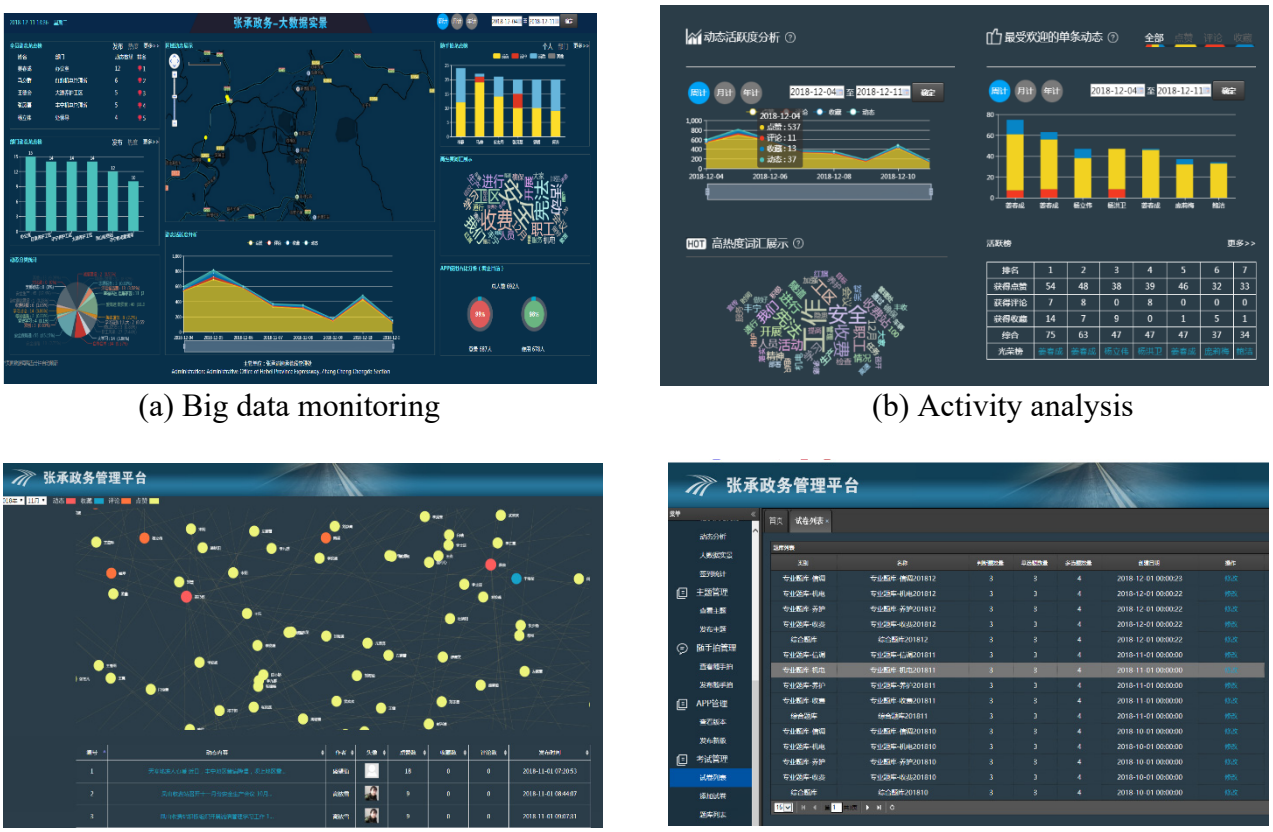
Considering the real needs from Chengde section management office of Zhangcheng expressway, we have realized the flat management platform, named as Zhangcheng Affairs. Figure 4 shows the main function pages of the dedicated App. Figure 4 (a) and Fig. 4 (b) give the functions of dynamic browsing, reading, commenting and commenting. Figure 4 (c) shows the tags (corresponding to different content classification requirements from the management office). Figure 4 (d) shows the instant photo function, which helps to reflect the real-time situation of different positions in time, and avoid increasing the staff's workload (writing reports, on-site inspections, etc.). In Fig. 4 (e), you can receive messages from your groups and participate in the related discussions.



(a) Dynamics (b) Comments (c) Dynamic labeling (d) Instant photo (e) Group discussion

Figure 4. Main App function pages of ZhangCheng Affairs.

Figure 5 shows the main web function pages of ZhangCheng Affairs. Figure 5 (a) gives the big data monitoring page, which refreshes data every five minutes. It helps to observer the dynamic situation of each station (Each yellow dot on the map corresponds to a dynamic state), the dynamic rankings and the activity rankings the departments, etc. By the natural language processing technology to mine the dynamic hot words of the whole staff, we can view the focus of attention of the whole staff in different cycles (day, week, month, self-selection time window) through the word cloud. The activity analysis page of Fig.5 (b) can analyze the dynamic changes in the cycle (day, week, month, self-selection time window), and give the dynamic Dynamic analysis. Figure 5 (c) uses the association analysis technology, Gephi network graph and table to show a comprehensive display of popular dynamic rankings, the focus of attention of the whole staff, hot spot dynamics and related points, collections, reviews, etc. in a certain period of time. Figure 5 (d) is the examination paper management page, which supports the reading, revision and design of examination papers.



(a) Big data monitoring (b) Activity analysis

(c) Hotspot dynamic visualization (d) Examination paper management

Figure 5. Main web function pages of ZhangCheng Affairs.

4. Conclusion

ZhangCheng Affairs has been on line since September 27, 2016. As of December 11, 2018, 681 persons (the office has 721 persons in total) have used the dedicated app. A total of 9875 dynamics have been published, and more than 30,000 comments and collections have been made. Through this platform, the whole staff can immediately receive the latest dynamics from all of the sites across 203 kilometers. It has fully inspired the enthusiasm of the whole staff to care about and participate in the daily work. The superiors and subordinates can communicate through the dynamics and discuss internal affairs through the department groups, which effectively improves the cohesion and centripetal force of the whole staff. The function of “instant photo” has been on line since November 1, 2017, as of December 11, 2018, a total of 23747 on-site situations have been issued, with an average of 59 items per day, which realized the "first on-site" display of the work situation in three periods: before, during and after the post. At the same time, through the functions of big data monitoring and dynamic analysis, the leaders can timely identify the concerns of the staff, the implementation of requirements and feedback from the staff, and can objectively analyze and make accurate decisions, which effectively improves the management efficiency.

Acknowledgments

This work is supported by the Hebei science and technology support program (17210104D); Science and technology research project of Hebei higher education institutions (ZD2015099); High-level talents subsidy Project in Hebei province (A2016002015); Science and technology planning project of Hebei provincial department of transportation (Y-2014025); Science and technology plan project of Chengde section of Zhangcheng expressway (CZC-2014KY-1); Overseas students science and technology activities preferred funding project of Hebei provincial department of human resources and social security (CL201613).

References

[1]. S.J.Sengupta and S.Singh. Service-oriented leadership style for CSR: a perceptions-based view. IUP Journal of Business Strategy, 15(2): 7-30 (2018).

[2]. M. Fourcade. Economics: the view from below. Swiss Journal of Economics and Statistics. 154:5 (2018).

[3]. E. Liang, Y. Liang and S. X. Cao." Research on development architecture of WeChat platform," in 3rd IEEE International Conference on Computer and Communications (ICCC), Chengdu, China, 2017, pp. 2512-2516.

[4]. Q. Li, D. Du, Z. M. Yang, B.X. Liu and J. Yan. A flexibility method of QQ forensic in Android system. in IEEE 2nd Advanced Information Technology, Electronic and Automation Control Conference (IAEAC), Chongqing, China, 2017, pp.855-861.

[5]. R. Tiganoaia, A. Cernian and A. Niculescu. The use of social platforms and personal data protection -An exploratory study. Networking in Education and Research (RoEduNet), Targu Mures, 1-5 (2017).

[6]. W. J. Hodson and B. Traynor. Folk classification of social media platforms: Preliminary findings. in International Professional Communication Conference (IPCC), Austin, TX, 2016, pp. 1-11.

[7]. Misra and J. M. Such. How socially aware are social media privacy controls. Computer, 49(3): 96-99(2016).

[8]. Z. C. Sun, J. Lu and F. Lv. Research and implementation of mobile application security detection combining static and dynamic. In International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), Changsha, China, 2018, pp.243-247.

[9]. A. Saghari, M.H. Mahrooz and S. Rahmani. Optimal decision making for orbit transfer system of a student micro-satellite, using multi-criteria decision making. in IEEE International Symposium on Systems Engineering (ISSE), Rome, Italy, 2015, pp. 29-33.

[10]. S. Yu, K. Sood and Y. Xiang. An effective and feasible traceback scheme in mobile internet environment. IEEE Communications Letters, 18(11): 1911-1914 (2014).

[11]. K. Park, M. C. Nguyen and H. Won. Web-based collaborative big data analytics on big data as a service platform. in 17th International Conference on Advanced Communication Technology (ICACT), Seoul, South Korea, 2015, pp. 564-567.