



# Text Mining Analysis of Online Consumer Reviews on Home IoT Services

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**Abstract.** This study explores the context of use, functions, and benefits of home Internet of Things (IoT) services through a text mining analysis of online consumer reviews. Data were collected from online text reviews that are open to the public and analyzed with R.3.3.3 and Ucinet6. The results were as follows. First, the CONvergence of iterated CORrelations analysis showed four clusters: control for convenience, safety from intruders, safety from users' carelessness, and saving. Second, the results of a cross-analysis of the 20 most frequently used keywords in the 3 service categories were as follows. In the context of use, in reviews about control and safety services, the frequently used terms included "go out," "going to work," "outside," and "forgetfulness." Reviews about safety services mentioned protection concerns, such as "children," "pets," "parents," and "alone." Further, some reviews about saving services used keywords related to seasonal cycles, such as "summer," "air conditioner," and "cumulative tax." Regarding functions, "check" was a frequently used keyword for all three service categories. Specific actions such as "turn off," "setting," and "control" were frequently present in reviews about control and saving services. Regarding benefits, the most frequently used keywords were "convenience" and "saving" in reviews about control services; "relief," "convenience," and "safety" in reviews about safety services; and "saving" and "convenience" in reviews about saving services. These results demonstrate that many consumers who use home IoT services positively experience a more convenient, safe, and economical life by using check and control functions in various situations.

**Keywords:** Home IoT services · Text mining · Online consumer reviews

## 1 Introduction

In recent years, the Internet of Things (IoT) service market has expanded in South Korea. According to the Ministry of Science and ICT in South Korea, the total number of IoT subscribers (vehicle control, remote control, wireless payment, tablet PC, and wearable devices among others) exceeded six million as of December 2017 [1]. The number of home IoT service subscribers of the telecommunication company with has the largest market share in South Korea, crossed one million in December 2017 [2].

It is important to understand the present state of IoT services and obtain consumer opinions on home IoT. Therefore, by using text mining analysis, this study explores the context of use, functions, and benefits of home IoT services by analyzing online consumer reviews on a leading Korean telecommunication company.

## 2 Method

Data were collected from publicly available online text reviews posted from June 23, 2016 to November 7, 2017 by using R.3.3.3. The cleaned dataset consisted of 4,932 reviews from which the words with the highest frequency and matrix data were extracted using R and the CONvergence of iterated CORrelations (CONCOR) analysis, which was conducted using the NetDraw packages of the Ucinet6 program. This was done to investigate the connection between similar keywords and clusters. Data were then analyzed to extract the top 20 keywords and the connection to clusters subsequently established after they were categorized into three main service categories: control, safety, and saving (Table 1) with R.

**Table 1.** Number of consumer reviews by home IoT service categories

	Service	F (%)	N (%)
Control	Electric power controller	1,879 (38.1)	2,414 (48.9)
	Electric light controller	443 (9.0)	
	Temperature controller	92 (1.9)	
Safety	Monitoring home situations with cameras and smartphones	948 (19.3)	2,303 (46.7)
	Remote control of gas valves (locking)	688 (14.0)	
	Alerting when door or window is opened	437 (8.9)	
	Monitoring automatic door lock system	230 (4.7)	
Saving	Checking power consumption	215 (4.4)	215 (4.4)
Total			4,932 (100)

## 3 Results

First, the CONCOR analysis revealed four clusters based on attributes of the 100 most frequently used keywords (Fig. 1). The first cluster was named “control for convenience” and included “power supply,” “smart phones,” “remote,” “operation,” “setting,” “control,” “automatic,” “reservation,” “simple,” “convenience,” and “surprising.” The second was “safety from intruders” and included “going to work,” “dual-income households,” “office,” “alone,” “children,” “pets,” “inside of house,”

“guard,” “check,” “observation,” “vacation,” and “long-term.” The third group of attributes was “safety from user’s carelessness” and included “gas,” “lock,” “electric light,” “danger,” “forgetfulness,” “remember,” and “mind.” The fourth was “energy and cost saving” and included “prevention,” “electric charge,” “effect,” “helpful,” “attention,” “habit,” “saving,” and “reduction.”

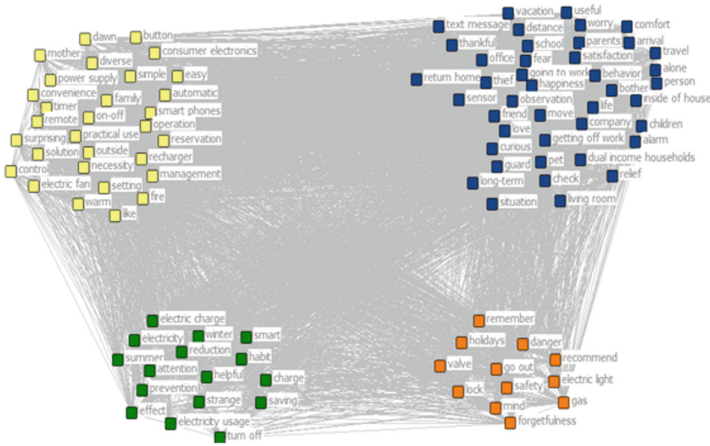


Fig. 1. Results of CONCOR analysis and visualization

Second, the cross-analysis of the 20 most frequently used keywords in each service category can be summarized in terms of three features of home IoT: context of use, functions, and benefits (see Table 2 and Figs. 2, 3 and 4).

**Context of Use.** Frequently used words in reviews about control and safety services were “go out,” “going to work,” “outside,” and “forgetfulness.” Reviews about safety services mentioned protection concerns, such as “children,” “pets,” “parents,” and “alone.” Furthermore, some reviews about saving services used keywords related to the seasonal cycles, such as “summer,” “air conditioner,” and “cumulative tax.”

**Functions.** “Check” was a frequently used keyword for all three service categories. Specific actions such as “turn off,” “setting,” and “control” were recurrent in reviews about control and saving services.

**Benefits.** The most frequently used keywords in reviews about control services were “convenience” and “saving”; those about safety services were “relief,” “convenience,” and “safety”; and those about saving services were “saving” and “convenience.”



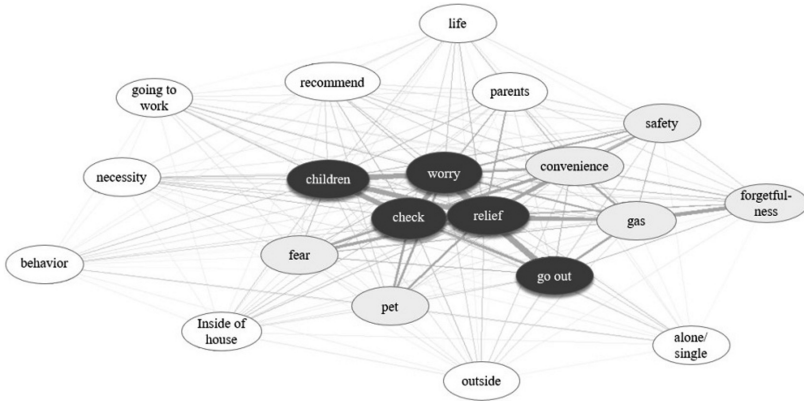


Fig. 3. Top 20 keywords in reviews about safety services

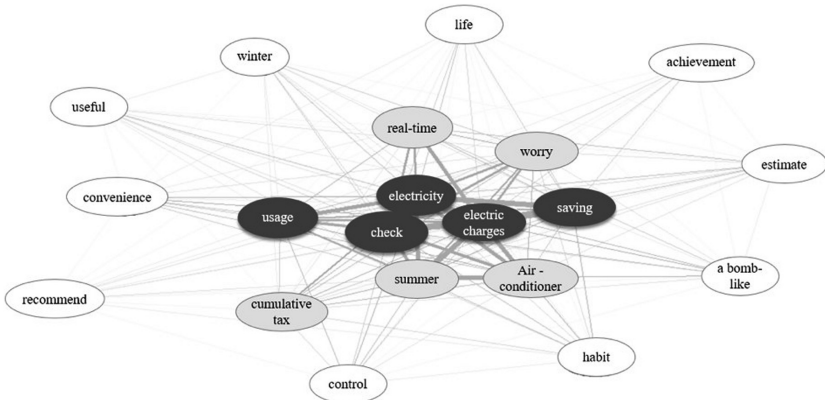


Fig. 4. Top 20 keywords in reviews about saving services

## 4 Conclusions

These results demonstrate that many consumers who use home IoT services positively experience a more convenient, safe, and economical life by using check and control functions in various situations. In particular, the frequency of the keyword “recommend” was relatively high in reviews about safety and saving services that contribute to the mitigation of risks and prevention of losses. Despite the growth of the home IoT market, consumers found themselves experiencing only convenience, savings, and safety offered by the service. Accordingly, in designing these home IoT services, it is

necessary to maximize the emotional satisfaction of consumers, rather than provide them with a simple functional benefit. Further research should therefore be conducted to maximize consumer satisfaction.

## References

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