

# Key Factors of Home-based Work in the Service Industry

서 창 적(서강대학교)

김 효 정(서강대학교)



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## Abstract

The purpose of this study is to identify the success factors for operations of home-based work in call center service settings. Both Delphi and survey methods were adopted to conduct this research. This study included 13 participants with experience in working from a home-based call center. Content Validity Rate (CVR) was used to judge the most effective factors in the Delphi Method. The Delphi results were then verified using multiple regression analysis based on the responses of 161 frontline employees who work at home. Using the Delphi method, 46 factors were elicited, including, meaning of work, online training system, organizational, social support, and simplicity of job/task. Among them, 12 factors such as meaning of work, work centrality, KMS, Remote IT system, HR-WFM system, Agent performance system, manager's transformational leadership, organizational social support, proper incentive scheme, narrow scope of task and process clarity shows significantly positive outcomes for the home-based workers. Giving employees variety in their working schedules shows a trade-off effect between service quality and productivity; it affects productivity positively but service quality negatively. The research provides service managers with the key factors of home-based operations that influence outcome performance and provides researchers with a framework of home-based study. The study's rigor was enhanced by using secondary data from company systems and internal performance data.

**Key words :** Home-based work Call center; Service productivity Delphi method Multiple Linear Regression Service Innovation

## I . Introduction

Service industry is one of the largest and fastest growing sectors of the economy. It is the basis of national growth and employment. Even though the service sector accounts for 70% of the domestic employment, its productivity is less than the manufacturing sector by 40%. The labor productivity of the South Korean manufacturing sector ranks 5th among the 19 OECD nations whereas, the labor productivity of the service sector ranks 18th. Moreover, the productivity of South Korean service industry is less than half of that of the U.S. service industry (Lee and Lee, 2012). Low productivity results in low investment in human resources, low wages, poor quality of work, and low job attraction. Therefore, improvement of the service productivity is a serious issue to attract qualified worker to provide high service quality.

Call Center services, one of the major non-face-to-face customer services, also suffer from low productivity. The call fluctuation gap is very big. The call volume gap between the peak hours and non-peak hours occurred in a day in the call center is as much as 125 times (Fitzsimmons and Fitzsimmons, 2010). Thus, appropriate staffing becomes difficult for the managers. If the call center is understaffed, customer satisfaction would decline and agents would burnout; if the call center is over-staffed, an increase in the idle time will lead to lower productivity.

To improve productivity, businesses in the United States, the largest call center market, have transferred their call center operations offshore, which has lower prices and could decrease operations costs. However, due to the constant annual increase in wages and inflation of the offshore countries, both effectiveness and efficiency were reduced. Customer complaints regarding the misinterpretation of queries by the offshore agents and cultural differences also have been increased. Consequently, many companies transferred their call centers back to the US and changed them to home-based operations (Beeler, 2010; Dubie, 2008; Butler, 2006)

Home-based work in call centers is increasing rapidly in the US to reduce operation costs. Contact Babel (2013) finds that there has been an annual increase in the number of home-based call centers since 2007 and that 42% of the US call centers adopted the home-based model in the year 2011.

Home-based model is an innovative way to raise the productivity of a call center (Suh and Kim, 2012). There are three main reasons for the increased productivity in the home-based model: First, home-based call center agents are usually more skillful at resolving customer inquiries and can handle more calls than the office agents. Companies thus, staff them during

the peak period when there are more chances of getting customer calls. Second, home-based agents show lower attrition than office agents, thereby, reducing the initial training and recruitment fees. Third, as home-based agents do not need office space and furniture, seat cost per agent is reduced (Bloom et al., 2013).

Whilst home-based model has many advantages such as improvement of productivity, employee retention, job attraction, and employee satisfaction, it may not be appropriate for all the organizations. Organizational structure, organizational support, home-based agents' characteristics, task type, equipment, and systems may affect the success of a home-based call center. Hence, we aim to verify if the home-based call center is more productive, and identify the success factors for the design and development of home-based call centers using the South Korean sample.

## II. Background and Literature Review

### 2.1 Home-based work (HBW)

Home-based work is a nontraditional working arrangement in which work duties are performed from home for most of the working time. It is the most popular form of telework.

Teleworking is working remotely from a traditional place of work, for a significant proportion of work time (Gray et al., 1993). It usually covers jobs such as, telemarketer or call center agents, data entry clerks, accountants, architects, consultants, insurance agents, lawyers, and computer programmers (Guimaraes and Dallow, 1999; Weiss, 1994). It can be divided into four major types: 1) "home-based work", where work is done at employee's home, 2) "satellite office, where work is done at remote offices that is controlled by the employer, 3) "telecenters", where employees are provided IT and work space from a given community, and 4) "the mobile telework", where employees are usually on the road with portable IT equipment (Daniels et al., 2001).

In South Korea, the terms Smart work, Telework and Home-based work are used equally for telework.

Toeffler (1980) said that home-based production, which resolves organizational, societal, and individual problems, would spread with technological advancement. Nowadays, a large number of people work from home and the trend has been increasing steadily for several years.

In the U.S., ACS (American Community Survey/Census) data showed that the number of home-based workers grew by 61% between 2005 and 2009. Schadler et al. (2009) predicted that 63 million people in U.S. would work from home by 2016. President Barack Obama signed

the Telework Act of 2010 into a law, thus, giving 1.2 million federal workers the option to telecommute for at least part of their working time.

In South Korea, the Korea Communications Commission (2011) announced in 2011 that smart-work including home-based work will be promoted to build a global smart-work country through work-life balance. It aims to have 30% of the employees work from home, satellite centers, or mobile offices by 2015. Korean Ministry of Employment and Labor (2011) will set up the guidelines for the adoption and execution of smart-work and distribute smart work guidebook to the HR managers.

## 2.2 Success factors of Home-based work

The success factors for home-based work can be classified into four categories (Suh and Kim, 2013): human resources, physical resources, organizational characteristics, and task characteristics.

### 2.2.1 Human Resource Perspective

Not all agents are appropriate at home-based work. According to previous studies, home-based workers are more likely to be self-motivated, able to work alone, tenacious, self-confident, skillful in time management, sincere, and have low social needs (Guimaraes and Dallow, 1999; Olson, 1983).

Olson (1983) interviewed 32 employees and their 8 managers and found that home-based workers tend to be self-motivated, skillful, and avoid social interaction beyond work and family. Most workers chose home-based work for family and followed a very strict routine similar to a regular work place, even though there were no obligations from the company.

Lim and Teo (2000) examined the demographic characteristics such as gender and marital status, work-related attitudes such as organizational commitment and job security, support factors, and perceived advantages and disadvantages of teleworking and the effect of organizations on the workers' attitudes towards teleworking by interviewing 285 IT professionals. People who are married and perceive teleworking as far more advantageous are more favorable to teleworking as compared to ones with high level of job insecurity and who associate more disadvantages with teleworking.

Baruch (2000) interviewed 62 teleworkers from five companies in the UK on their experience with teleworking and identified following success factors: 1) match between work and family demands, 2) sufficient space at home, 3) no need for physical presence in the office, 4) personal qualities and circumstances that suit teleworking, and 5) supportive organizational

culture. While time management skills and the ability to keep touch through the Internet are required personal characteristics, technical skills were not considered important. Age and presence of children were also found to be important factors. Some researchers argue that the success of teleworking was not affected by the characteristics of workers but by their environment (Barunch, 2000).

On comparing the impact of telework between the private and public sectors, Cooper and Kurland (2002) find that professional isolation of teleworkers is strongly associated with employee's learning, interpersonal networking with other employees in the organization, and mentoring from colleagues and superiors.

Gajendran and Harrison (2007) performed meta-analysis of 46 studies on 12,883 employees for the positive and negative consequences of teleworking. Telework affects perceived autonomy, work-family balance, job satisfaction, performance, turnover intent, and role stress positively. Contrary to the previous studies, teleworking does not have any straightforward, adverse affects on work relationships, or perceived promotion opportunities, but a strong intensity of telework strains the relationship with colleagues.

Tung et al. (1995) identified and ranked the motivators for teleworking in the order of time flexibility, reduction in child care costs, time/cost savings of telecommuting, savings of clothing expenditures, and increased job satisfaction. Drawbacks of teleworking are ranked in the order of impediments to career growth, social isolation, conflict between work and home, increase in the equipment cost, and lack of professionalism.

### **2.2.2 Physical Resource Perspective**

Some researchers argued the importance of providing appropriate IT infrastructure to the home-based workers and proper communication between workers and manager.

Gupta et al. (2000) identified the patterns of computer and communication technologies usage by studying 375 teleworkers. Computer, modem, fax, electronic mail, credit card verification, multiple phone lines, and computer information network usage levels were measured. They found that highly educated employees are more likely to use computer and communications technologies and individual background, employment, residential, and occupation characteristics determine the usage of these technologies.

Belanger et al. (2001) investigated three constructs believed to affect teleworking performance, such as availability of IT, communication technologies, and communication patterns of teleworkers. The results indicate that technology affects productivity, performance, and employee satisfaction positively, whereas work group communications affect perceived productivity and performance negatively.

Beaumont et al. (2009) performed exploratory research of the home working case to determine the qualitative benefits and costs. They conducted a series of semi-structured in-depth interviews with eight home workers, four of their line managers and 13 staff members of one company via phone, e-mail, or face-to-face interview. They found that the home workers were very satisfied with their status, especially those who experienced an improvement in their work - life balance. The vast majority of home workers were in their late 40s to early 50s and had particular lifestyle/life-stage circumstances such as young children at school or personal/family health issues. They insisted that information and communication technology(ICT) was the enabler that would raise employee engagement and meet customer expectations. They concluded that home working for service delivery produces a win-win outcome and can be an employee engagement initiative, but that it is not suitable for everyone.

### 2.2.3 Organizations Perspective

Many studies argue that supportive organizational culture and role of teleworker managers are important organizational characteristics (Poissonet, 2002; Harrington and Ruppel, 1999; Baruch and Nicholson, 1997). The authors emphasize that managers should be emotionally and technically supportive, communicative, and result-oriented (Guimaraes and Dallow, 1999 Hartman et al., 1992; Staples et al., 1998).

Fonner and Roloff (2010) investigated the relationship between teleworking factors and job satisfaction and compared the level of teleworkers' job satisfaction with that of non-teleworkers. The study finds stress of meetings and interruption, perceived organizational politics, information exchange, and work-life conflict as the most important factors that influence job satisfaction. The frequency of information exchange relates negatively with the telework, but positively with the associated management of the work-life balance, lower stress levels from interruptions, and less exposure to self-interested and unjust behaviors.

Kylin (2007) studied the work/non-work relationship in the context of home-based telework. She found that advances in telecommunication structures and the linkage of IT networks provide opportunities for many individuals to perform work from their homes. She also suggested organizations need to develop policies that support the combination of work and other life domains.

Two types of tasks are fit for telework: tasks that require a low level of autonomy and are simple and easy to control remotely, and tasks that require a high level of autonomy and are complex (Barunch and Nicholson, 1997; Poissonet, 2002).

Poissonet (2002) performed a study to identify key factors for the design and development

of telework arrangements and analyze how they affect successful work outcomes. She found significant differences between teleworkers and non-teleworkers and found that teleworkers experience higher levels of job satisfaction, organizational commitment, and perceived performance than do non-teleworkers. However, her study lacked potentially important control variables such as age, tenure, and industry, and used only self-reported performance.

Bloom et al. (2013) conducted an experiment based on the call center of a Chinese company. The company suffered from high office rental costs in Shanghai. They recruited 500 employees to participate the study and asked half of them to work from home, while the other half were asked to work at the office. The authors analyzed the change in participants' performance longitudinally. The study tracked performance over three phases: the pre-experiment stage, the experiment stage, and the post-experimental stage. They compared data on performance, labor supply, attrition, promotions, reported employee work satisfaction, detailed demographic information, and survey information on attitudes towards the program. The study's results showed that people who worked from home were 13 percent more productive than were people working in an office. The study also showed that people working from home were more efficient and more satisfied with their work, and had lower turnover. However, their promotion rate fell.

Edwards and Field-Hendrey (2002) found different motivations for choosing on-site or home-based work. Their analysis focused on the participation of married women because married women are usually in charge of the majority of child-rearing activities and household maintenance. They found that women have a different process than men when deciding whether or not to work and how much. They also argue women have a different minimum wage level, which is dependent on many factors such as the presence of children and other income.

Lieke et al. (2012) investigated the pros and cons for employee outcomes of new ways of working (NWW), which includes home-based work. The study surveyed 110 employees who work for a large telecom company in the Netherlands. They examined the effects of NWW on work engagement and exhaustion, and investigated whether communication, connectivity, and interruptions mediated these relationships. They found that NWW positively affect work engagement and enhance engagement through high-paced work, effectiveness, and continuous communication.

### 2.3 Delphi Technique

The Delphi method was first used at Rand Corporation in the early 1950s to determine the possibility of attacks from Russia (Dalkey and Helmer, 1963; Linstone and Turoff, 1975:). The

method is designed to obtain consensus from a group of experts on a specific topic, generate ideas, and extract important factors in the professional domain (Strauss and Zeigler, 1975). It uses repeated questionnaire responses and controls feedback in a structured manner. Panel members respond to a series of questionnaires by letter or telephone, and increasingly via e-mail.

### III. Delphi Study

We used a two-phase research plan. The first phase consisted of Delphi studies with 13 senior-level managers from eight different Korea-based firms. The respondents' titles ranged from department directors or senior managers to vice-presidents. Their functional responsibilities included contact center operations, strategic planning, human resource management, and marketing.

This phase involved about 160 home-based workers from three major organizations. They all had functional responsibility for customer care within their organizations. Participants were asked to describe their organizations, tasks, IT systems, and themselves using about 120 items. Secondary data about their productivity and service quality were collected.

This Delphi study aimed to elicit the key factors for home-based work from industry managers. The Delphi method is useful when we study new concepts or variables that have not been studied in previous research. Home-based work in non-face-to-face service is in the introductory stages. In South Korea, only 12 companies out of 2,000 have adopted home-based work. Therefore, we used a Delphi study to elicit the key factors of home-based work.

#### 3.1 Research Design

The literature on Delphi suggests two to four rounds for designing a Delphi based study (Linstone and Turoff, 1975; Martino, 1983). We chose three rounds to balance the duration of research, refine ideas from iterative process, and control the feedback process.

Development of initial questions needs care and attention since the respondents may not be able to answer appropriately if they do not understand the question. To overcome this issue, two of the most knowledgeable managers among the experts group were chosen for a pilot test. One of the managers received service innovation prizes for adopting the home-based model within the organization and the other was invited as a speaker at the call center conference on the best practices for home-based call centers. The authors developed a preliminary initial questionnaire based on the literature review, which was examined by two

experts.

We developed 57 questions on the basis of expert reviews (TABLE I). Questionnaire consisted of structured questions with additional columns to collect comments/opinions of experts beyond the asked questions. The structured questions were used to diminish the consequences of ‘open-ended’ questions that usually draw small and limited answers.

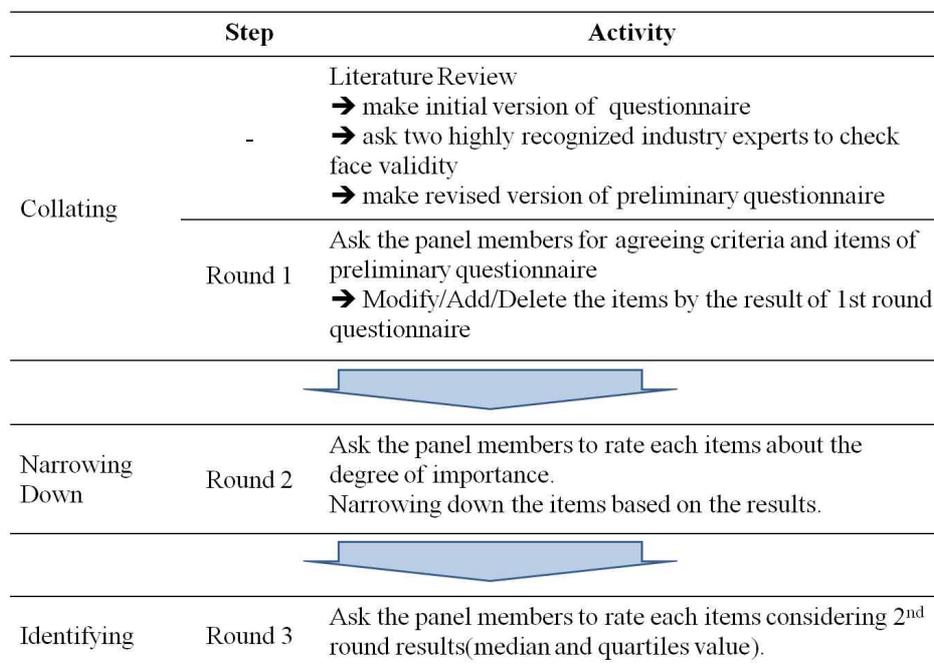
<Table I> Initial Delphi Questionnaire

		Attributes	References
Resource	Human Resources	Individual circumstances: age, marital status, burden of raising children, commuting time	Baruch (2000), Lim and Teo (2000), Fonner and Roloff (2010), Tung et al. (1995)
		Career characteristics: company tenure, agent tenure, home-based agent tenure	Tung et al.(1995), Fonner and Roloff(2010)
		Personality: Challenging spirit, sense of responsibility	
		Individual Perceptions: conflict within organization, Avoiding career gap, office work satisfaction, feeling of isolation	Lim and Teo (2000), Cooper and Kurland (2002), Tung et al. (1995), Olson (1983)
		Attitude: Meaning of work, work centrality, family centrality	Poissonet (2002), Olson (1983)
	Physical Resource	Security System: Information Data Security, Voice Data Security, Recording file security	Tung et al. (1995)
		Agent support system: online training, knowledge management system, remote IT assist, WFM system, HR system (HR Data and Payment)	
		Communication system: video conference system, teleconference system, community system,	Olson (1983)
		real-time monitoring and barge-in system,	
		Agent Requirements: Independent work place, broadband internet connection	
Process	Organizations	Organizational structure: Independence of home-based team, Helpdesk/IT team for home-based team, narrow span of control	
		Organizational support: Manager’s organizational capability, manager’s communication style, technical support, social support, manager’s leadership style, specialized incentive scheme, Same training opportunity with office agent, Timely	Lim and Teo (2000), Daniels (2001), Olson (1983), Fonner and Roloff (2010),

	feedback/communication from manager, Frequent feedback/communication from manager	Poissonet (2002)
	Organizational situation: High ratio of applicants hired, High attrition rate, adoption within whole organization	Tung et al. (1995)
Task	Task simplicity, Narrow scope of task, Task Identity, Frequent recency of task	Poissonet (2002)
	Call type: Inbound, Outbound, Blended	

The definition of successful performance was explained to the panels before Round 1. Productivity was defined as operational performance, employee engagement as organizational performance, and service quality and perceived service performance as customer performance. After this explanation, the round 1 Delphi questionnaire was issued.

The whole process of this Delphi study is shown below (Figure 1).



<Figure 1> The whole process of this Delphi study

### 3.2 Research Sample

Selection of the industry experts is a critical component of the Delphi method because results are based on their insightful opinions. The experts are selected based on four factors: knowledge and experience on the research issue, willingness to participate, sufficient time to

participate in the research seriously, and effective communication skills. Since expert opinion is sought, a purposive sample is necessary where participants are chosen not to represent ordinary people, but for their expert ability to answer the research questions.

In South Korea, only 12 companies adopted the home-based model of call centers in telecommunication, insurance, home shopping, and logistics industries (Suh and Kim, 2012). As we had to collect the opinions of people who are experienced and experts in managing home-based call centers, target sample was quite limited.

We recruited 13 experts, experienced in managing home-based call centers and willing to participate voluntarily, from 8 organizations representing different industries like telecom, insurance, and home-shopping, for the Delphi study (TABLE II). The combined experience of all the panelists in office-based work added to 119 years, while the combined home-based experience totaled 44 years. In comparison to the maturity of Korean home-based work style, the experience of panelists was considered sufficient to give meaningful opinions.

<Table II> LIST of Panelists

<i>Name</i>	Sex	Industry	<i>Experience (years)</i>	
			<i>Call center</i>	<i>Home-based work</i>
<i>Kang</i>	<i>M</i>	<i>Telecom</i>	<i>11</i>	<i>1</i>
<i>Kim</i>	<i>F</i>	<i>Insurance</i>	<i>5</i>	<i>2</i>
<i>Nam</i>	<i>M</i>	<i>Telecom</i>	<i>8</i>	<i>2</i>
<i>Moon</i>	<i>M</i>	<i>Telecom</i>	<i>12</i>	<i>5</i>
<i>Park</i>	<i>F</i>	<i>Retail</i>	<i>6</i>	<i>6</i>
<i>Park</i>	<i>F</i>	<i>Telecom</i>	<i>12</i>	<i>3</i>
<i>Park</i>	<i>F</i>	<i>Telecom</i>	<i>11</i>	<i>5</i>
<i>Sohn</i>	<i>M</i>	<i>Insurance</i>	<i>11</i>	<i>2</i>
<i>Lee</i>	<i>M</i>	<i>Telecom</i>	<i>7</i>	<i>5</i>
<i>Lee</i>	<i>M</i>	<i>Insurance</i>	<i>9</i>	<i>5</i>
<i>Jung</i>	<i>M</i>	<i>Retail</i>	<i>9</i>	<i>6</i>
<i>Han</i>	<i>F</i>	<i>Retail</i>	<i>9</i>	<i>1</i>
<i>Lee</i>	<i>F</i>	<i>Retail</i>	<i>9</i>	<i>1</i>
<i>Kang</i>	<i>M</i>	<i>Telecom</i>	<i>11</i>	<i>1</i>
<i>Total</i>			<i>119</i>	<i>44</i>

### 3.3 Research Sample and Procedure

From the sample population of 12 call centers that adopted home-based work arrangement in South Korea, three companies were selected for the respondents sample used in this study,

based on their organizational experience in home-based work (long experience: more than 7 years, medium experience: 3-7 years, short experience: less than 3 years). All the respondents were front-line workers (that is, call center agents) responsible for customer service.

The data used in analysis consists of both primary data collected from self-reported questionnaire and secondary data on respondents performance.

The survey was administered to the home-based and office workers (non-home-based workers) in the Insurance, Telecom, and Home-shopping industry call centers. Survey participants were contacted by managers within each company, who had participated in the previous Delphi study. The survey participants were selected randomly by team unit but not individual unit and were given a \$2 e-Gift card as a token of appreciation. Any illogical, incomplete, or missing responses were verified and completed through phone calls or e-mail.

### 3.4 Results of Delphi Round 1 and Round 2 Questionnaire Development

The Round 1 Questionnaire is administered to the Delphi participants and the data obtained from the completed questionnaire is analyzed according to the qualitative coding and statistical summarizing methods.

The responses obtained in Round 1 form the basis of developing the questions for the Round 2 questionnaire. The results of Round 1 were analyzed using the respondents frequency. From the Round 1 responses, 10 questions were added, 1 question was deleted, and 7 questions were modified to improve clarity (TABLE III). As the result, a total of 64 questions were selected for Round 2.

<Table III> Results of Delphi Round 1

Result	Category	Details
Delete	Human Resource	Age
Add	Human Resource	Time management skills
		Spontaneous level of home-based worker
	Physical Resource	Agent performance system
		Online test system
		Real-time communication system (such as messenger or chatting)
	Organization	Specialized career program
		Various working schedule
		Various offline meeting to feel sense of belonging
Specialized home-based supervisor training program		
Task	Process Clarity	

### 3.5 Results of Round 2 and Round 3 questionnaire development

The Round 2 questionnaire is distributed to the participants for approximately two weeks. All of the respondents from Round 1 also contributed to the Round 2.

The respondents were asked to rate the importance of the various factors in answer to the question, "How do you think that each of the following items is important to home-based call center success" on a seven-point scale (with 1= strongly disagree, 4= neutral, and 7= strongly agree).

The lowest rated items that received less than 30% importance are challenging spirits, narrow span of control, adoption within whole organization, and blended call type (TABLE IV).

<Table IV> Results of Delphi Round 2

Result	Category	Details
Delete	Human Resources	Challenging Spirits
	Organization	Narrow span of control
		Adoption within whole organization
	Task	Blended call type

### 3.6 Results of Round 3

The Round 3 Questionnaire uses the responses from the Round 2. After the deletion of four questions, 60 questions were asked in Round 3. For each of the 60 home-based call center characteristics, the group's average importance rating and the range between the 1st and the 3rd quartiles of round 2 was shown and the respondents were asked to re-rate the characteristics after reviewing the opinion of others. The survey participants are given the opportunity to change their ratings and if their rating is outside of the quartiles, they were asked to provide the reasons for their significantly different evaluation from the other reviewers (Linstone and Turoff, 1975).

To validate the results, we use the CVR (Content Validity Ratio) value, which was devised by Lawshe (1975)

$$CVR = \frac{n_e - N/2}{N/2} \dots\dots\dots \text{식(1)}$$

Where: ne = number of panelists indicating "essential" and N = total number of panelists.

When fewer than half the number of panelists rate as "essential," the CVR is negative. When half of the number of panelists say "essential" and half do not, the CVR is zero. When all the panelists say "essential," the CVR is computed to be 1.00. The CVR is useful in deciding which item to reject and which to retain. A CVR value is computed for each item.

When the Delphi panel is composed of 13 members, a minimum CVR of 0.54 is required to satisfy the five percent significance level (TABLE V).

<Table V> Minimum Value of CVR

No. of panelist	Min. Value
5	0.99
7	0.99
10	0.62
13	0.54
15	0.49

The overall responses to Round 3 are shown in TABLE VI.

<Table VI> Results of Delphi Round 3

Category	Table Column Head		
	Item	CVR	Remarks
Human Resources (16)	Sense of responsibility	1.00	More than 0.54
	Time management skills	1.00	
	Family centrality	1.00	
	Burden for raising children	0.85	
	Meaning of work	0.85	
	Work centrality	0.85	
	Spontaneous level of home-based worker	0.85	
	Commuting time	0.23	Lower than 0.54
	Agent tenure	0.23	
	Feeling of isolation	0.23	
	Office work satisfaction	0.08	
	Company tenure	-0.38	
	Marital status	-0.85	
	Home-based agent tenure	-1.00	
	Conflict within organization	-1.00	
	Avoiding career gap	-1.00	

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Physical Resources (17)	Information Data Security System	1.00	More than 0.54
	Voice Data Security System	1.00	
	Recording file security System	1.00	
	Online training System	1.00	
	Knowledge management system	1.00	
	Remote IT assist System	1.00	
	Agent performance system	1.00	
	Real-time communication system	1.00	
	Real-time monitoring and barge-in system	1.00	
	Independent work place	1.00	
	Broadband internet connection	1.00	
	Teleconference system	0.85	
	Online test system	0.85	
	WFM System	0.69	
	HR system (HR Data and Payment)	0.69	
	Video conference system	0.08	Lower than 0.54
	Community system	0.08	
Organization Characteristic (20)	Manager's organizational capability	1.00	More than 0.54
	Manager's communication style	1.00	
	Various offline meeting to feel sense of belonging	1.00	
	External expenditure (Electric tax, internet fee) support	1.00	
	Home office equipment (Desk PC, Headset, chair) support	1.00	
	Timely feedback/communication from manager	1.00	
	Organizational technical support	1.00	
	Independence of home-based team	0.85	
	Organizational social support	0.85	
	Manager's leadership style	0.85	
	Specialized incentive scheme	0.85	
	Manager's technical support	0.69	
	Various working schedule	0.69	
	High attrition rate	0.69	
	Frequent feedback/communication from manager	0.69	
	Helpdesk/IT team for home-based team	0.54	
	Specialized career program	0.54	
Specialized home-based supervisor training program	0.38	Lower than 0.54	
High ratio of applicants hired	0.23		
Same training opportunity with office agent	0.08		

Task Characteristics (9)	Process Clarity	0.85	More than 0.54
	Task simplicity	0.85	
	Task Identity	0.85	
	Narrow scope of task	0.85	
	Response type: Outbound	0.69	
	Frequent recency of task	0.54	
	Response type: Inbound	0.54	

### 3.6.1 Human Resources characteristics

The panelists deemed only 7 of the 16 items on the human resources category significant. Approximately 43% of the human resources questions were considered significant. The highest rated characteristics in Round 3 included sense of responsibility, time management skill, and family and leisure centrality.

### 3.6.2 Physical Resources characteristics

The panelists deemed 15 of the 17 items on the physical resources category significant. Approximately 88% of the physical resources questions were considered significant. The highest rated physical resources characteristics included Data Security Systems, Online training system, Knowledge management system, Remote IT system, Agent performance system, Real-time communication system, and Real-time monitoring and barge-in system. Independent work place with broadband internet connection is essential for the agent.

### 3.6.3 Organizational characteristics

The panelists deemed 17 of the 20 items on the organizational characteristics significant. 85% of the organizational characteristic questions were considered significant. The highest rated organizational characteristics are manager's organizational capabilities, manager's communication style, offline meetings to encourage the sense of belonging, additional expenditure support, home office equipment support, timely feedback from manager, and technical support.

### 3.6.4 Task characteristics

The panelists considered all the seven task characteristics and 100% of the task characteristics questions significant. However, the highest rate for task characteristics is

only 0.85, which means that not all participants consider these items essential. The highest rated task characteristics included clear transfer process beyond the responsible job, task simplicity, task identity, and narrow scope of task.

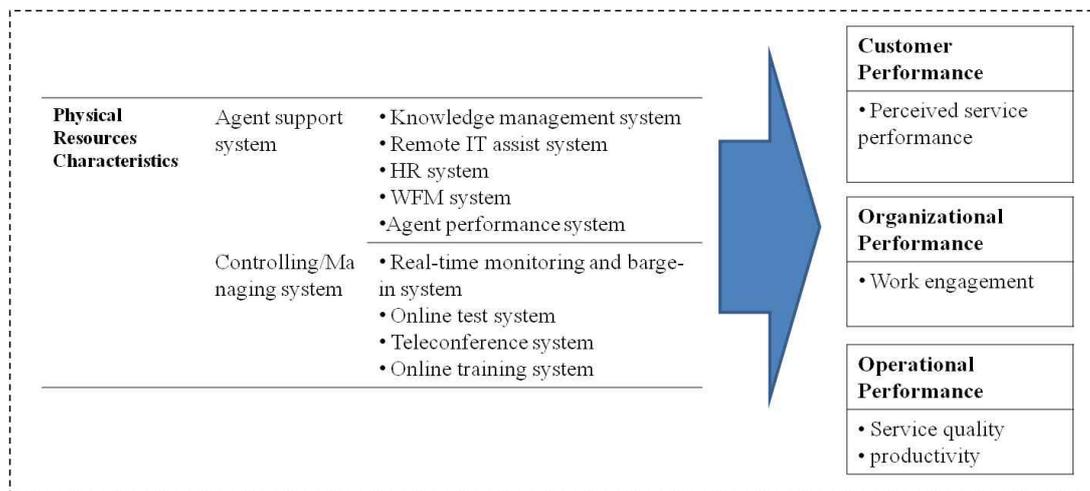
## IV. Survey Study

This study aims to verify the key factors that were elicited from managers' opinion. To study this, a 105-items survey questions designed for home-based workers were surveyed to frontline employees.

### 4.1 Research Design

This study proposed the following research model to verify the elicited from Delphi results. Some variables which are not adequate the study were eliminated. Some variables such as 'security systems', 'independent work place for agents home' are required essentially to operate home-based work in call center. Based on these, this chapter presents research model as follows (See Figure II).

The research model includes five domains: (1) human resources characteristics, (2) physical resources characteristics, (3) organizational characteristics, (4) task characteristics, and (5) performance. The measures of success include one type of performance of interest to customers—perceived service performance, one type of performance of interest to



<Figure II> Research Model of Survey Study

organizations—work engagement, and two types of performance of interest to operations—service quality and productivity.

## 4.2 Measures

The variables were measured through a 105-item survey designed for home-based workers and a 101-item survey for office workers. The questionnaires were identical; office workers did not answer four items specific to home-based workers.

### 4.2.1 Independent Variables

Items that appeared as significant in the Delphi results were selected as independent variables for the survey study. Bailey and Kurland (2002) found that many researchers studied home-based work from the perspective of the individual worker and argued that researchers must include other operating components. Therefore, in this study we focus variables from Physical Resource characteristics.

### 4.2.2 Dependent Variables – Performance

Most empirical studies on home-based work use self-reported surveys to collect data from home-based workers. However, the gap between perceptions and actual behavior is very significant. The self-reported surveys could have many problems like common method bias in research (Shin et al., 2000). Respondents tend to exaggerate performance on self-evaluation. Therefore, in this study, we not only surveyed respondents but also gathered real data on respondents' performance.

Two sources were used to collect real data for this research, call quality sheet score and calls per hour generated from the CTI system. The mean scores of HBW are higher than OW. We measured productivity using calls per hour and service quality using call quality sheet score. The data used in the analysis consists of both primary data collected from self-reported questionnaire and secondary data on respondents' performance.

#### (i) Employee Performance—Work Engagement

In Beaumont et al.'s (2009) study, the authors stated that home working for service delivery produces a win-win outcome and can be an employee engagement initiative.

Based on Lieke et al. (2012)'s study, work engagement was assessed with four items of the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006). Example items are: "I

am proud of my job," "I am enthusiastic about my job," "Time flies when I am working ," and "I feel happy when I am working intensely." All items were scored on a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree").

**(ii) Customer Performance—Perceived Service Performance**

This study measured service performance through a self-reported survey. In the questionnaire, respondents rated service performance in comparison with other organizations in their sector. They responded to this question: "Compared to other organizations in your sector, do you think your organization has higher performance in relation to service quality/customer satisfaction/repurchase rate/good reputation?" These items were based on Podnar and Golob's (2010) study. All items were scored on a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree").

**(iii) Customer Performance—Service Quality**

Service quality was measured using "call quality sheet" scores. Each worker's call quality sheets score was rated by an internal quality assurance analyst (QAA). Non-face-to-face service agents are usually rated three times per month. A QAA monitor evaluates the attitude, communication skills, and knowledge of each agent so that call quality can reach the level desired by the company.

**(iv) Operational Performance—Productivity**

Productivity is measured by the number of phone calls answered or made per hour. This measure is called calls per hour (CPH) and is used as a measure of individual productivity within the industry. For inbound call service, the calls of CPH are answered customer calls. For outbound call service, calls means calls connected with the customer, not dialed calls.

### 4.2.3 Control Variables

We use variables that are significantly different in HBW and OW as control variables. As seen in Table VII, the variables, response type, working time, tenure and age are significantly different in the two categories.

The response type (inbound/outbound) and working time (four, seven, eight, or nine hours) are significantly different for the two groups. Home-based workers were significantly older and had shorter tenure with the current company than office workers. Therefore, response type, working time, age, and tenure were used as control variables.

<Table VII> Anova results for Equality of Means among control variables between Home-based worker and Office worker

	HBW		OW		Sig.
	Mean	Stan Dev.	Mean	Stan Dev.	
Industry	2.06	.823	2.07	.825	.878
Response type	1.31	.464	1.00	.000	.000
Service type	1.55	.894	1.54	.888	.908
Working time (hour)	7.77	1.193	9.00	.000	.000
Tenure (natural logarithm)	2.92	.761	3.17	1.035	.021
Age (natural logarithm)	3.58	.138	3.42	.250	.000
Education	1.77	.785	1.70	.788	.417

### 4.3 Results

#### 4.3.1 Sample Descriptions

The sample consisted of 161 home-based workers from three organizations. The industry association of the respondents was: 50 (31.1%) insurance, 52 (32.3%) retail, and 59 (36.6%) telecom. Of the respondents, 68.9% handled inbound calls, and only 31.1% handled outbound calls. The working time of home-based workers ranged from four to nine hours, while regular office workers work for nine hours. The largest group (36.6%) consisted of home-based workers working for seven hours from 10 a.m. to 5 p.m., while the smallest (4.3%) proportion consisted of those who worked for four hours.

The tenure of respondents in the current company was less than 1 year for 52 (32.3%) respondents, 1 to 2 years for other 44 (27.3%) respondents, 2 to 3 years for 25 (15.5%) respondents, 3 to 4 years for 9 (5.6%) respondents, 4 to 5 years for 3 (1.9%) respondents and more than 5 years for 12 (7.5%) respondents. The ages of respondents ranged between 18 and 48, with the mean age being 36.2 (SD= 5.0) years. Over 70% of respondents had a high school or a college degree.

<Table VIII> Descriptive Statistics

Description		%	
Industry (N=161)	Insurance	50	31.1%
	Retail	52	32.3%
	Telecom	59	36.6%
Response Type (N=161)	Inbound	111	68.9%
	Outbound	50	31.1%

Service Type (N=161)	Service	117	72.7%
	Sales	0	0
	Both	44	27.3%
Working Time (N=152)	4hours	7	4.3%
	7hours	59	36.6%
	8hours	34	21.1%
	9hours	52	32.3%
Tenure in current company (N=145)	Less than 1 year	52	32.3%
	1 to 2 years	44	27.3%
	2 to 3 years	25	15.5%
	3 to 4 years	9	5.6%
	4 to 5 years	3	1.9%
	More than 5 years	12	7.5%
	Mean / SD	2.1	2.1
Age (N=143)	18 to 29 year	13	9%
	30 to 39 year	91	62.8%
	40 to 49 year	41	28.3%
	Older than 50 year	0	0%
	Mean / SD	36.2	5.0
Education (N=142)	High school	62	38.5%
	College	51	31.7%
	University	28	17.4%
	Graduate school	1	6%
Reason to be Home-based worker (N=157)	Time management	13	8.1%
	Commuting time and difficulty	45	28.0%
	Cost savings	4	2.5%
	Work-life balance	88	54.7%
	Disability or illness	4	2.5%
	To care for an ill family member	2	1.2%
	Company policy	1	0.6%

#### 4.3.2 Reliability and Validity

Inter-item analysis is used to check the scales for reliability. Cronbach's reliability coefficient is calculated for each construct, as suggested in many studies on operations research (Smith and Reece, 1999).

In general, it is considered adequate to get a Cronbach's alpha value over 0.7 to ensure reliability of the internal consistency (Nunally, 1978). Most of the Cronbach's values in this study were over 0.8 and all of them were over 0.6. Therefore, we assured the reliability of internal consistency.

Factor analysis, which gives evidence of a single latent construct, was used to check

unidimensionality of scales (Flynn et al., 1995). Results of the factor analysis and reliability, shown in Table IX, indicate that each factor has reliability and was validly represented by its relevant items.

<Table IX> results of Reliability and Factor Analysis

Physical Resource Characteristics KMO(.887) Bartlett's (11052.315) Sig.(.000)					
HR and Work Force Management system	.945	.828 .822 .820 .800 .800 .757	.813 .830 .822 .800 .764 .721	13.045	43.318
Teleconference and online training system	.923	.830 .819 .801 .635 .626 .613	.883 .882 .854 .830 .850 .841	2.954	59.254
Online test system	.957	.855 .846 .834	.910 .899 .877	1.854	66.126
Real-time monitoring and barge-in system	.927	.869 .851 .804	.924 .921 .793	1.621	72.130
Knowledge Management system	.931	.867 .815 .814	.917 .827 .846	1.344	77.111
Remote IT assist system	.927	.846 .827 .809	.874 .928 .880	1.265	81.799
Agent performance system	.942	.858 .846 .788	.948 .917 .833	1.099	85.871
Perceived Performance KMO(.892) Bartlett's (1241.934) Sig.(.000)					
Work engagement	.945	.921 .915 .904 .903	.931 .918 .909 .906	5.374	67.173
Customer performance	.852	.845 .826 .817 .780	.777 .707 .792 .752	1.320	83.673

### 4.3.3 Multiple Regression Analysis

We used physical resource characteristics as predictors, and perceived performance, service quality, and productivity as dependent variables.

Table X shows the regression results of physical characteristics on performance. We added response type, working time, tenure, and age as control variables. Tenure and age were transformed to standardized values using natural logarithm.

<Table X> results of Multiple Regression Models of Physical Resource Characteristics on Performance

Dependent variable	Self-report		Secondary data	
	Work engagement	Perceived service performance	Service quality	Productivity
(constant)	-.352	-.200	5.501	-3.284
Independent				
Knowledge management system	-.387	2.726*	.073	.988
Real-time monitoring and barge-in system	-.989	.096	-3.027*	.688
Remote IT assist System	4.245**	1.587	3.518*	-1.334
Online test system	.944	.254	.339	-.770
Teleconference and training system	-1.669	-.316	-.654	-.203
HR and WFM system	3.241*	2.307*	-1.569	-.186
Agent performance system	1.973†	1.263	1.441	1.636
Control				
Response type	.149	.905	6.047**	6.186**
Working time	-1.282	.940	-5.089**	3.250*
Tenure(natural logarithm)	-1.552	.108	.796	2.098*
Age(natural logarithm)	1.692	.153	-.120	2.524*
Model Fit	.399**	.406**	.572*	.380**

The direct effect of Knowledge Management System on perceived service performance is positive and significant ( $p < 0.05$ ). The direct effect of real-time monitoring and barge-in system on service quality is negative and significant ( $p < 0.05$ ). The direct effect of Remote

IT assist system on work engagement and service quality is positive and significant ( $p < 0.01$ ,  $p < 0.05$ ). The direct effect of online test system, as well as teleconference and training system on all performance variables is not significant. The direct effect of HR and WFM system on work engagement and perceived service performance is positive and significant ( $p < 0.05$ ). The direct effect of Agent performance system on productivity is also positive and significant ( $p < 0.10$ ).

In short, knowledge management, remote IT, HR and WFM, and agent performance systems showed positive and significant effects on perceived performance. Remote IT system also showed positive and significant effects on secondary data for productivity. However, real-time monitoring and barge-in system showed negative and significant effects on secondary data for service quality.

HR and WFM system is associated the most with performance. Remote IT assist system and knowledge management system also affect performance. The systems that are implemented primarily for company needs, such as online test, teleconference and training system, and real-time monitoring system, do not affect performance at all. However, systems that meet agents' needs, such as knowledge management system, IT assist system, HR system, and performance system, affect performance.

## V. Conclusion

Home-based work of call centers is in the introductory stages in South Korea. Only 12 companies out of 2,000 have adopted the home-based work. This study reveals key factors that will be helpful for managers considering adopting and operating a home-based work environment.

From the Delphi study, 46 factors among 4 characteristics were elicited. Panel members has convergent opinion that Data Security Systems, Online training system, Knowledge management system, Remote IT system, Agent performance system, Real-time communication system, and Real-time monitoring and barge-in system is essential for operating call centers.

And in the physical resource characteristics, we found that HR-WFM system is associated the most with performance. Remote IT assist system and knowledge management system also affect performance. The systems that are implemented primarily for company needs, such as online test, teleconference and training system, and real-time monitoring system, do not affect performance at all. However, systems that meet the agents' needs, such as knowledge management system, IT assist system, HR system, and performance system, affect

performance.

The contribution of this study relates to rigor. Shin et al. (2000) argued that home-based work research has lacked rigor in various ways, including reduction of sampling bias, data collection, and so on. They also argued that most empirical studies on home-based work use self-reported surveys to collect data from home-based workers. The gap between perceptions and actual behavior is very significant. Moreover the self-reported surveys could have many problems like common method bias (Shin et al., 2000).

This study has limitations that we only found evidence of direct effect. A number of variables showed no direct effect on performance in this study. Thus, further research is required to identify other indirect (moderated or mediated) paths that might fully account for the relationship between home-based work and performance. In addition, a longitudinal study could assess changes in performance in connection with the home-based work arrangement.

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