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**USE OF MODERN TECHNOLOGIES FOR MONITORING FIELD OPERATIONS:
PHILIPPINES 2010 CENSUS OF POPULATION AND HOUSING**

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Use of Modern Technologies for Monitoring Field Operations
Philippines 2010 Census of Population and Housing

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I. Introduction

The Philippines National Statistics Office (PNSO), during its conduct of the 2007 Census of Population (POPCEN 2007), first implemented the use of Progress Monitoring System (PMS) that relied on the Short Message Service (SMS) or popularly known as text messaging. PMS is designed to track the overall progress of census and field operations, and to evaluate the completeness of census coverage in each enumeration area (EA) while the enumeration was still ongoing.

The provincial, regional, and central offices of PNSO monitored the progress of enumeration through the PMS. The PMS generated reports on the number of households, institutions, and persons enumerated based on the information sent by area supervisor through SMS (short messaging system or text messaging). The availability of cellular phones and the pervasive use of text messaging in the country allowed the SMS technology as a viable medium for transmitting data required in the PMS.

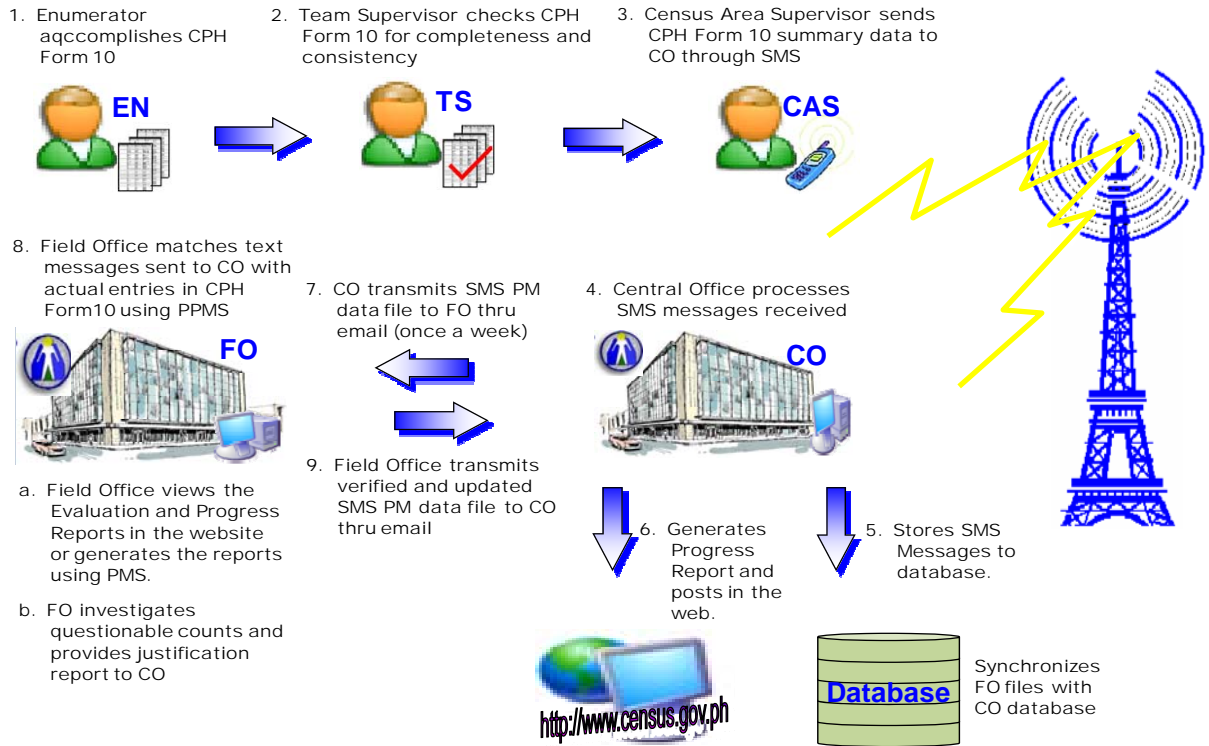
In the 2010 Census of Population and Housing, the use of PMS was again implemented. Problems that were encountered and weaknesses that were identified during the POPCEN 2007 were addressed and a better PMS was put to use.

II. Flow of Progress Monitoring Operation

The flow of data and documents for use in monitoring the progress of enumeration are as follows:

1. During enumeration, the enumerator (EN) had to transcribe in the CPH Form 10 (EN's Accomplishment Report/Progress Monitoring Report) the information on the number of households, institutions, and number of persons by sex based on CPH Form 1 (Listing Booklet).
2. The team supervisor (TS) received the CPH Form 10 and CPH Form 1 submitted by the EN for verification as to completeness and correctness of entries in the said forms.
3. The census area supervisor (CAS), after receiving the CPH Form 10 from TS, sent the verified information to the central office (CO) through SMS or text messaging using his/her registered cellular phone. CAS received an SMS receipt number from CO to serve as confirmation that the data have been received and stored in the databases.
4. Central Office (CO) processed the text messages.
5. Text messages were stored in the database. The CO also synchronized the data files of Field Offices (FO) with CO database for updates.
6. The Progress Monitoring System at the CO generated progress reports and posted them in the NSO website for access of FOs.
7. CO automatically transmitted data files to FO through email at least once a week.
8. The FO loaded the data file to the PMS. Validation of text messages was done by matching the entries in CPH Form 10. The FO viewed evaluation and progress monitoring reports from the NSO website or generated the said reports. FO conducted evaluation during field operation. FO also investigated questionable counts and provides justification report to CO.
9. FO submitted verified and updated SMS data file to CO through email.

2010 Census of Population and Housing Progress Monitoring System

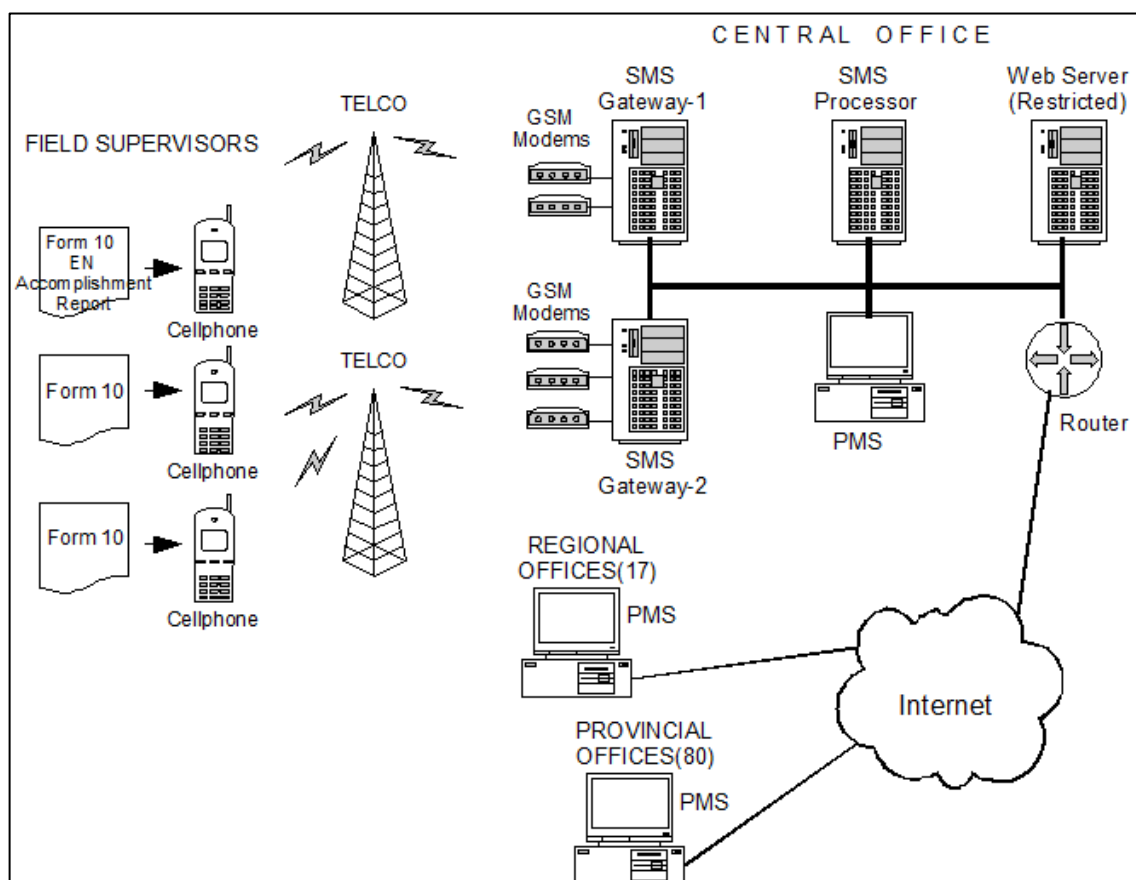


III. Infrastructures Needed for PMS

The implementation of PMS required infrastructures such as the following:

1. The CAS had to be equipped with cellular phones to enable them to transmit data through text messages.
2. NSO Central Office was furnished with a set of equipment for messages handling and processing. The GSM modems, which are the equivalent of cellular phones with their own SIM cards, were hooked up to SMS Gateway computers to receive the incoming messages. The SMS gateway computers were configured to recognize keywords used in the text messages and forwarded all PMS-related messages to the SMS Processor computer box.

3. Other computers at the CO were responsible in aggregating the counts coming from the text messages and transforming them into web pages. Access to these web pages was restricted and limited only to NSO offices and officials through the use of user-ID and passwords.
4. Computers at the FO were installed with PMS. These computers were used for generating reports and transmitting data files.



IV. Other Important Features of PMS

1. Safeguard against unauthorized senders

The system ensured that only authorized users were allowed to transmit PMS data. Registration of the cellular phone number through a text message using

a specific keyword was undertaken. Together with the keyword, the CAS had to supply the geographic code of his/her area of assignment plus an access code. The access code was assigned to the CAS by the NSO-CO. Upon successful registration, the same cellular phone number was able to send the subsequent data for the EA.

2. Preventive measure to counter duplication of transmittal

The geographic codes of the enumeration area were required in sending the data pertaining to households, institutions, and persons. In addition, a date that served as control code was included in the transmission. The combination of the geographic and EA codes plus the control code served to indicate a new transmission for the same EA data. A different combination meant a new data. If information was sent with the same combinations of the codes mentioned, these information were treated as duplicate transmissions. PMS automatically responded with error message.

For cases of corrections, the geographic and EA codes were again required in addition to the specific corrections that were necessary. Specific SMS Receipt Number had to be supplied to serve as confirmation of the update action. A record cannot be updated without the SMS Receipt Number.

V. Technical Concerns

These are some of the technical concerns with the implementation of PMS:

1. Traffic congestion

Text messages that were simultaneously sent to CO resulted to traffic congestion in the receipt and transmittal of messages.

2. Modem limitations

Using a GSM modem to receive and send out response messages could result in a longer queue of messages waiting to be either received or dispatched. The message queues could reach a critical level such that the modem operation freezes. When the modem freezes, there are no text messages that can be received or sent out.

3. Dead zones

Few areas where cellular phone services were not available because the mobile phone signal was blocked by terrain, distance, or too much trees.

VI. Format of SMS or Text Message

1. For registration of cellular phone, the CAS should text:

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PMREG<space>Aaaaa<space>Ppp<space>Mmm<space>NAME<space>  
<name of CAS>
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2. Sending data through text messaging, the CAS should text:

```
PM<space>Dmdd<space>Ppp<space>Mmm<space>Bbbb<space>Eeee  
e<space>Ts<space>Ccccc<space>HHnnn<space>HPnnn<space>HMnnn  
<space> HFnnn <space> IPnnn <space> IMnnn <space> IFnnn<space>  
REM <space> <Remarks>
```

VII. List of Progress Monitoring System Reports

The PMS programs installed in the computers of the NSO CO and FO were equipped with a computerized reporting system. These reports were used to assess, as early as possible, the areas that were under-enumerated or over-enumerated.

1. PMS Report 1 – EA Weekly Report
2. PMS Report 2 – SMS Transaction Record
3. PMS Report 3 – EA Progress Enumeration Report
4. PMS Report 4 – Barangay Coverage Report
5. PMS Report 5 – Data Evaluation Report

Example of an SMS File:

Date	smscheckno	SMS RECEIPT NO	Provin	Municipi	Barang	Enumeration Area	enumstatu	HH	HP	HM	HF	IP	IM	IF	remarks	updatestatu	mobilenumber	dateverified	Matc
0521	0149	01306	01	01	001	0000	1	53	250	121	129	0	0	0		0	+639056456394	07/13/2010	
0526	0278	01833	01	01	001	0000	1	97	430	232	198	0	0	0		0	+639056456394	06/01/2010	
0518	0141	01309	01	01	002	0000	1	28	127	59	68	0	0	0		0	+639056456394	06/01/2010	
0518	0143	01721	01	01	003	0000	1	40	199	110	89	0	0	0		0	+639152230759	06/01/2010	
0519	0145	01531	01	01	004	0000	1	74	285	146	139	0	0	0		0	+639152230759	06/01/2010	
0519	0147	01840	01	01	005	0000	1	38	166	84	82	0	0	0		0	+639152230759	06/04/2010	
0517	0259	01016	01	01	006	0100	1	54	234	120	114	0	0	0		0	+639152230759	06/01/2010	
0	0	0	01	01	007	0000	1	25	121	58	63	0	0	0		0	+639056456394	05/28/2010	
0	0	0	01	01	007	0000	1	69	370	189	181	0	0	0		0	+639056456394	06/01/2010	
0	0	0	01	01	008	0000	1	38	171	90	81	0	0	0		0	+639056456394	05/28/2010	
0	0	0	01	01	008	0000	1	53	240	116	124	0	0	0		0	+639056456394	06/01/2010	
0518	01829	01829	01	01	009	0000	1	39	205	101	104	0	0	0		0	+639056456394	06/01/2010	
0524	01430	01430	01	01	009	0000	1	66	294	161	133	0	0	0		0	+639056456394	06/01/2010	
0520	01128	01128	01	01	011	0000	1	58	299	162	137	0	0	0		0	+639152230759	06/01/2010	
0520	0161	01415	01	01	012	0000	1	47	204	97	107	6	6	0		0	+639056456394	06/01/2010	
0519	0163	01425	01	01	013	0000	1	38	158	77	81	0	0	0		0	+639056456394	06/01/2010	
0526	0292	01326	01	01	013	0000	2	114	532	265	267	0	0	0		0	+639056456394	06/01/2010	
0518	0167	01203	01	01	015	0000	1	25	120	60	60	0	0	0		0	+639056456394	05/28/2010	
0526	0296	01327	01	01	015	0000	2	133	616	327	289	0	0	0		0	+639056456394	06/01/2010	
0518	0179	01617	01	01	016	0000	1	37	159	89	70	0	0	0		0	+639152230759	06/01/2010	
0521	0308	01841	01	01	016	0000	1	52	247	120	127	0	0	0		0	+639152230759	06/04/2010	
0520	0173	01507	01	01	018	0000	1	40	163	80	83	0	0	0		0	+639056456394	05/28/2010	
0519	0175	01024	01	01	019	0000	1	55	215	99	116	0	0	0		0	+639152230759	06/01/2010	
0519	0177	01418	01	01	020	0000	1	39	180	94	86	0	0	0		0	+639152230759	06/01/2010	
0518	0189	01219	01	01	021	0000	1	27	135	78	57	0	0	0		0	+639152230759	06/01/2010	
0520	0181	01411	01	01	022	0000	1	75	347	163	184	0	0	0		0	+639056456394	05/28/2010	
0522	0310	01738	01	01	022	0000	1	36	160	86	74	0	0	0		0	+639056456394	06/01/2010	
0518	0183	01404	01	01	023	0000	1	24	118	66	52	0	0	0		0	+639056456394	05/28/2010	
0524	0312	01339	01	01	023	0000	1	81	368	191	177	0	0	0		0	+639056456394	06/04/2010	
0518	0185	01705	01	01	024	0000	1	18	81	44	37	0	0	0		0	+639056456394	05/28/2010	
0520	0314	01135	01	01	024	0000	1	46	229	106	123	0	0	0		0	+639056456394	06/01/2010	
0524	0187	01614	01	01	025	0000	1	35	193	81	112	0	0	0		0	+639152230759	05/28/2010	
0518	0191	01508	01	01	027	0000	1	24	122	58	64	0	0	0		0	+639056456394	05/28/2010	
0522	0320	01437	01	01	027	0000	1	70	320	152	168	10	5	5		0	+639056456394	06/01/2010	
0522	0393	01513	01	01	028	0200	1	36	177	89	88	0	0	0		0	+639056456394	05/28/2010	

VIII. Measures to Safeguard the PMS Reports

In the implementation of PMS, information derived from the PMS Reports that were accessible to FO became susceptible to premature and unauthorized release of census results. Thus, measures to safeguard the PMS Reports were necessary.

1. Strict compliance with the existing rule on confidentiality in releasing census information
2. Issuance of directive to all personnel involved in the PMS against premature and unauthorized release of census results
3. Instituted in the PMS a mechanism to embed information on the person who generated the PMS reports
4. Access to reports generated was limited to authorized NSO personnel with given user ID and password
5. PMS data files cannot be copied or extracted