

Technological Levels of Information Management System

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Abstract

Development projects have increasingly realized the Importance of Information Management System (IMS). With advancement of technology, automated system is getting popularity. However, it is not the computer alone that makes the system functional. An excel based automated system constituting filing of record sheets, data entry in excel spread sheet, analysis using pivot table and reporting information will be a good start considering the cost and expertise.

1. Introduction

Development projects have increasingly realized the importance of Information Management System (IMS) for aiding decision making and programming. Government provokes development organizations to follow results based management and IMS for better accountability to delivering services and transparency of achieved results. IMS constitutes information need identification, techniques and tools for collating data, analyzing data to generate and disseminate information to stakeholders.

Some organizations follow manual IMS based on paper works in analyzing data and generating information. Sophisticated systems are being developed with the advancement of technology and capacity. Other organizations use automatic system constituting computerized Excel or web based software, among others. However, organizations need to craft their own systems based on information requirement, financial, technical and human resource capabilities. Technical advancement is not the panacea for all types of IMS.

This paper categorizes technological levels of IMS mainly into two parts: 1) Manual System and 2) Automated System based on the use of computer application. Automated System is further categorized into 2.1) Excel-based IMS and 2.2) Web-based IMS. The paper is structured into conceptual understanding of IMS, information needs and technological levels of IMS. At length, conclusions are drawn.

2. Information Management System – Conceptual Understanding

The term 'System' is widely used and discussed in institutional development process. It dates back to 'Greek antiquity' (Abraham, 1992:39). A system constitutes structure and function, as Abraham (1992:39) defines a system that 'consists of two or more units that relate to each other in a structural relationship and form an entity whose elements are functionally inter-dependent.' In the same line, Oxford (2000:1320) defines system as 'a group of things, pieces of equipment, etc. that are connected or work together: a transportation system...'

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In information management, an IMS is a process that involves collection, organization and communication of information to ensure smooth operation of projects and organizations. Information is used not only for operational procedures, but also for strategic and programmatic decisions. It is not limited only to information technologies (Siles 2004). Paul Currian, cited in Siles (2004) argues that it is not the information technology that creates better information systems; rather it is the organizational culture that determines the priority to information management process.

For better understanding IMS, it is necessary to conceptualize 'data' and 'information' as they are often interchangeably understood and used. Siles (2004:29) argues that 'Without the proper data we cannot have good information, without good information we cannot create knowledge, and without knowledge we cannot experience wisdom.'

Oxford (2000) defines data as facts that are used to find out things or to make decisions. They are qualitative or quantitative attributes of a variable. Siles (2004:29) defines data as 'un-processed collection or representation of raw facts, concepts, opinions or instructions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms in a manner suitable for communication, interpretation, or processing by humans or by automatic means' (Siles 2004:29). An example of data is the number of participants in training. Data are not directly used in a decision making and programming processes.

For the purpose of this paper, I use quantitative data. Quantitative data are numeric facts that can be used for mathematical treatments such as addition, subtraction, multiplication, division to derive average, standard deviation and other sophisticated mathematical values. There are different types of quantitative data. Some quantitative data are discrete such as countable and numeric such as 25 persons attending training; and others are continuous using decimal numbers such as women constitute 38.6 percent of total participants in training on income generating activities. In this paper, I use both discrete and continuous data for exemplary purposes.

Siles (2004:29) quotes Peter Druker defining information as 'data endowed with relevance and purpose. 'Thus, 'information' is a set of data that are classified, analyzed and interpreted and used for decision process. For example, at a meteorological centre, data on maximum and minimum temperatures are recorded on daily basis or at some period of time. Those data for a day or at some point in time provide no information unless those data are compared with a set of data recorded for some time interval, revealing information on whether it is getting warmer or colder

The term 'management' refers to actions undertaken by different authorities involved from data collection to decision processes. Thus, IMS involves different authorities undertaking different responsibilities for managing data and information so that the objectives of collating, compiling and communicating are met.

Siles (2004) classifies project management information system into four categories based on level of technology. The first level he terms as paper based information system the projects that do not require or have technology apply for managing information. The second level requires using the computer to manage information. As the volume of information increases, the third level use database and the

fourth level he terms as fully integrated system that applies sophisticated technologies such as web-based database software. The conclusion is that the level of technological sophistication increases with the volume of information to manage. He warns that giving due consideration to automation than systematization may not be the appropriate solution in the given context of information requirements of an organization. Automation should follow systematization of information management.

I classify the level of IMS based on technology broadly into two categories: 1) Manual System and 2) Automated System. I define manual system as constituting the process of data categorization and summary manually by counting and calculating or using calculators to calculate summation and percentage. I define the automated system constituting data categorization and summary using computer application. Based on computer application, I categories automated system into two parts: 1) excel based automated system and 2) web-based automated system.

I argue that the concerned authorities in an organization need to understand the manual system to identify how data are summarized and reported to upper levels of reporting. With that understanding, an organization needs to develop tailor made software in Excel for efficient management of information. If needed and organization has reliable internet access, an organization can go for sophisticated web-based technologies.

3. Information Flow

Information flow in an organization depends on hierarchy of reporting. Some organizations devise manual system that uses papers and pens or minimum application of computer application for summarizing data to report information. Others user automated system ranging from excel spread sheets to even sophisticated computer applications such as web-based system. However, it is the human resource and their undertaking of specific tasks that makes the system functional.

I present examples of information flow in a project in Nepalese development context to show what data are required, how data are generated, categorized and analyzed to generate information at different level of organizational hierarchy. I exemplify a project that has hierarchical organizational units at different administrative levels such as centre, district and village development committee (VDC) (Diagram 1). The project provided 84 events of Income Generating Activity (IGA) training to community people at 12 VDCs in 3 districts (Kathmandu, Lalitpur and Bhaktapur).

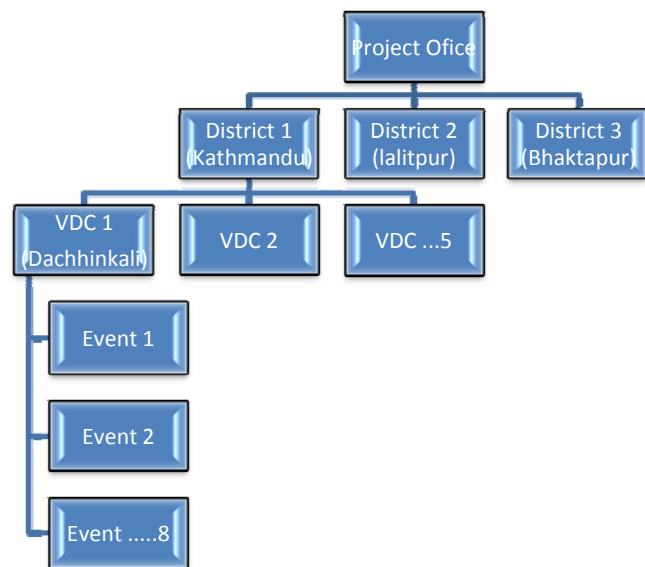


Diagram 1: Project organizational hierarchy and number of training events

Of them, Kathmandu district office covered 5 VDCs. Dachhinkali is one of five VDCs intervened in Kathmandu. Eight events were conducted in Dachhinkali VDC.

Project Manager, District Manager and VDC Manager would be interested to know information about training participant to make decisions as to who need to be targeted in future training. Following are some information:

- How many training events were conducted?
- How many persons attended IGA training?
- How many women attended training?
- How many caste/ ethnic groups² attended the training?
- How many participants by different caste/ ethnic groups attended the training?
- What percentage of participants were women?
- What percentages of participants were from different caste/ ethnic groups?

Table 1 presents the summary of events and participants that the Project Manager and central stakeholders would be interested to know. One can easily interpret that altogether 84 events were organized in 12 VDCs of three districts. Most of the events were conducted in Kathmandu district. More than two thousand participants attended the training, of which more than three fifth were men and more than two fifth were from participants other caste/ ethnic groups.

Table 1: IGA training and participants in Kathmandu, Lalitpur and Bhaktapur (example)

District	VDC	Event	Dalit				Janajati				Others				Total			
			Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%
Kathmandu	5	32	120	80	200	28.0	130	65	195	27.3	200	120	320	44.8	450	265	715	100
Lalitpur	4	28	110	95	205	30.7	150	87	237	35.5	150	76	226	33.8	410	258	668	100
Bhaktapur	3	24	100	75	175	27.5	100	86	186	29.2	180	95	275	43.2	380	256	636	100
Total	12	84	330	250	580	28.7	380	238	618	30.6	530	291	821	40.7	1240	779	2019	100
%			16.3	12.4	28.7		18.8	11.8	30.6		26.3	14.4	40.7		61.4	38.6		

I have highlighted (shaded) the first row on Kathmandu in table 1 for detailed elaboration. This row reveals the summary of events and participants. However, Kathmandu District Manager and stakeholders might be interested to know details of participants in 5 VDCs of Kathmandu, which are elaborated in table 2. Table 2 reveals that of the 715 participants who attended in 32 events conducted in five VDCs of Kathmandu, more than three fifth were men and more than two fifth were from other caste/ ethnic groups.

² I follow caste/ ethnic categorization of participants as Dalit, Janajati and Others for exemplary purpose. Dalits are considered marginalized communities and Janajatis are indigenous nationalities. This categorization is not the main point of concern in this paper.

Table 2: IGA training and participants, Kathmandu (example)

VDC	Event	Dalit				Janajati				Others				Total			
		Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%
Dachhinkali	8	30	23	53	31.4	23	12	35	20.7	52	29	81	47.9	105	64	169	100
Kapan	5	17	15	32	29.4	28	11	39	35.8	28	10	38	34.9	73	36	109	100
Naikap	7	27	15	42	24.7	30	18	48	28.2	48	32	80	47.1	105	65	170	100
Phutung	6	22	14	36	26.3	25	13	38	27.7	38	25	63	46.0	85	52	137	100
Suntole	6	24	13	37	28.5	24	11	35	26.9	34	24	58	44.6	82	48	130	100
Total	32	120	80	200	28.0	130	65	195	27.3	200	120	320	44.8	450	265	715	100
%		16.8	11.2	28.0		18.2	9.1	27.3		28.0	16.8	44.8		62.9	37.1	100	

As above, I have highlighted (shaded) the first row on Dachhinkali VDC of Kathmandu in table 2. This row reveals the summary of participants in eight events. However, Dachhinkali VDC Manager and stakeholders might be interested to know details of participants in all eight events, which are elaborated in table 3. Of the total 169 participants, three fifth were men and four tenth from other caste/ ethnic groups.

Table 3: IGA training and participants in Dachhinkali VDC, Kathmandu (example)

Event	Dalit				Janajati				Others				Total			
	Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%
1	5	3	8	34.8	3	1	4	17.4	8	3	11	47.8	16	7	23	100
2	4	3	7	35.0	4	2	6	30.0	5	2	7	35.0	13	7	20	100
3	5	5	10	45.5	3	2	5	22.7	3	4	7	31.8	11	11	22	100
4	4	3	7	31.8	3	2	5	22.7	6	4	10	45.5	13	9	22	100
5	3	3	6	27.3	2	1	3	13.6	9	4	13	59.1	14	8	22	100
6	3	2	5	23.8	2	1	3	14.3	8	5	13	61.9	13	8	21	100
7	3	2	5	26.3	3	2	5	26.3	6	3	9	47.4	12	7	19	100
8	3	2	5	25.0	3	1	4	20.0	7	4	11	55.0	13	7	20	100
Total	30	23	53	31.4	23	12	35	20.7	52	29	81	47.9	105	64	169	100
%	17.8	13.6	31.4		13.6	7.1	20.7		30.8	17.2	47.9		62.1	37.9	100	

From data and discussion from tables 1 to 3, it is clear how data are summarized from lower to upper levels and converted into information. In summary, total values from table 3 go to first row of table 2 and total values in table 2 go to first row of table 1 in summarizing data from VDC level to central project office level.

4. Technological Levels of Information Management System

Computer application is an aid to efficient IMS. The level of IMS ranges from manual system to highly automated system. Manual system does not use computer or uses for typing and simple calculations. Unlike, automated system applies already existing computer applications or tailor made applications for automatic summary of data to derive useful information.

As above, I have highlighted (shaded) the first row (event) from Dachhinkali VDC of Kathmandu in table 3. Dachhinkali VDC Manager and stakeholders might be interested to know details of participants in that first event.

Both manual and automated systems can generate information upto table 3. Processes defer according to the technological levels for tabulating detailed data for each row in table 3. The only thing is calculations are done manually in manually generated tables and automatically generated in automated system. However, manual and automated systems apply separate procedures to generate detailed table for each row in table 3. These are discussed below under respective sections.

4.1 Manual System

In manual system, detailed data set is located at the VDC level and is not available at the district and project office levels. Table 4 presents categorized tabulation of each participant in the training according to gender and caste/ ethnicity. Total values from this table go to first row of table 3 above. Of 23 participants, more than three fifth were men and two fifth from other caste/ ethnic groups.

In manual system, this table can be generated using manual calculations. Use of calculator to calculate sum and percentage will be an advantage over manual calculation. Besides, this table can be generated in the computer using Microsoft word table feature or Excel spreadsheet.

Table 4: IGA training and participants in the first event held in Dachhinkali VDC, Kathmandu (example of manual system)

SN	Name of Participant	Dalit				Janajati				Others				Total			
		Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%	Man	Woman	Total	%
1.	Ram B. Pant									1		1		1		1	
2.	Sita Kumari BK		1	1											1	1	
3.	Jit B. Gurung					1		1							1		
4.	Prem Kumar Shrestha					1		1							1		1
5.	Kanchana Rai						1	1								1	1
6.	Bhagwati Adhikari										1	1				1	1
7.	Kedar Giri									1		1			1		1
8.	Pramila Rasali		1	1												1	1
9.	Tularam Chaudhary					1		1							1		1
10.	Ram Prit Yadav									1		1			1		1
11.	Tara Ghirmire										1	1				1	1
12.	Govinda Agrawal									1		1			1		1
13.	Rabi Bista									1		1			1		1
14.	Ram Pariyar	1		1											1		1
15.	Nabin Sharma									1		1			1		1
16.	Bishwo Nepali	1		1											1		1
17.	Pramod KC									1		1			1		1
18.	Kedari Nepali	1		1											1		1
19.	Suntali BK		1	1												1	1
20.	Prajol Kurmi									1		1			1		1
21.	Puskar Pariyar	1		1											1		1
22.	Ramila Pant										1	1				1	1
23.	Kasiram BK	1		1											1		1
	Total	5	3	8	34.8	3	1	4	17.4	8	3	11	47.8	16	7	23	100
	Percent													62.1	37.9		

Table 4 builds on the participant's record sheet that is filled up during training. This sheet could look like that presented in table 5. This sheet is filed in the event file.

Table 5: IGA training and participants of the first event held in Dachhinkali VDC, Kathmandu (example of participants' list)

SN	Name of Participant	Address	Organization	Position
1.	Ram B. Pant		Ekta Saving and Credit Cooperative	Secretary
2.	Sita Kumari BK		Srijansheel Women's Group	Chairperson
3.	Jit B. Gurung			
4.	Prem Kumar Shrestha			
5.	Kanchana Rai			
6.	Bhagwati Adhikari			
7.	Kedar Giri			
8.	Pramila Rasali			
9.	Tularam Chaudhary			
10.	Ram Prit Yadav			
11.	Tara Ghirmire			
12.	Govinda Agrawal			
13.	Rabi Bista			
14.	Ram Pariyar			
15.	Nabin Sharma			
16.	Bishwo Nepali			
17.	Pramod KC			
18.	Kedari KC			
19.	Suntali BK			
20.	Prajol Kurmi			
21.	Puskar Pariyar			
22.	Ramila Pant			
23.	Kasiram BK			

4.2 Excel-Based Automated system

Excel is powerful Microsoft software that is particularly used for calculations.

Columns are created in Excel spread sheet to enter district name, VDC name, participant name and categorization of participant by gender and caste/ ethnicity. Data from table 5 is entered. This table will be as given in table 6. Same table in Excel spread sheet looks like presented in diagram 3.

Table 6: IGA training and participants of first event held in Dachhinkali VDC, Kathmandu (example of excel based automated system)

SN	District	VDC	Event	Name of Participant	Gender	Caste/ Ethnicity
1.	Kathmandu	Dachhinkali	1	Ram B. Pant	Man	Others
2.	Kathmandu	Dachhinkali	1	Sita Kumari BK	Woman	Dalit
3.	Kathmandu	Dachhinkali	1	Jit B. Gurung	Man	Janajati
4.	Kathmandu	Dachhinkali	1	Prem Kumar Shrestha	Man	Janajati
5.	Kathmandu	Dachhinkali	1	Kanchana Rai	Woman	Janajati
6.	Kathmandu	Dachhinkali	1	Bhagwati Adhikari	Woman	Others
7.	Kathmandu	Dachhinkali	1	Kedar Giri	Man	Others
8.	Kathmandu	Dachhinkali	1	Pramila Rasali	Woman	Dalit
9.	Kathmandu	Dachhinkali	1	Tularam Chaudhary	Man	Janajati
10.	Kathmandu	Dachhinkali	1	Ram Prit Yadav	Man	Others
11.	Kathmandu	Dachhinkali	1	Tara Ghirmire	Woman	Others
12.	Kathmandu	Dachhinkali	1	Govinda Agrawal	Man	Others
13.	Kathmandu	Dachhinkali	1	Rabi Bista	Man	Others
14.	Kathmandu	Dachhinkali	1	Ram Pariyar	Man	Dalit
15.	Kathmandu	Dachhinkali	1	Nabin Sharma	Man	Others
16.	Kathmandu	Dachhinkali	1	Bishwo Nepali	Man	Dalit
17.	Kathmandu	Dachhinkali	1	Pramod KC	Man	Others
18.	Kathmandu	Dachhinkali	1	Kedari Nepali	Man	Dalit
19.	Kathmandu	Dachhinkali	1	Suntali BK	Woman	Dalit
20.	Kathmandu	Dachhinkali	1	Prajol Kurmi	Man	Others
21.	Kathmandu	Dachhinkali	1	Puskar Pariyar	Man	Dalit
22.	Kathmandu	Dachhinkali	1	Ramila Pant	Woman	Others
23.	Kathmandu	Dachhinkali	1	Kasiram BK	Man	Dalit

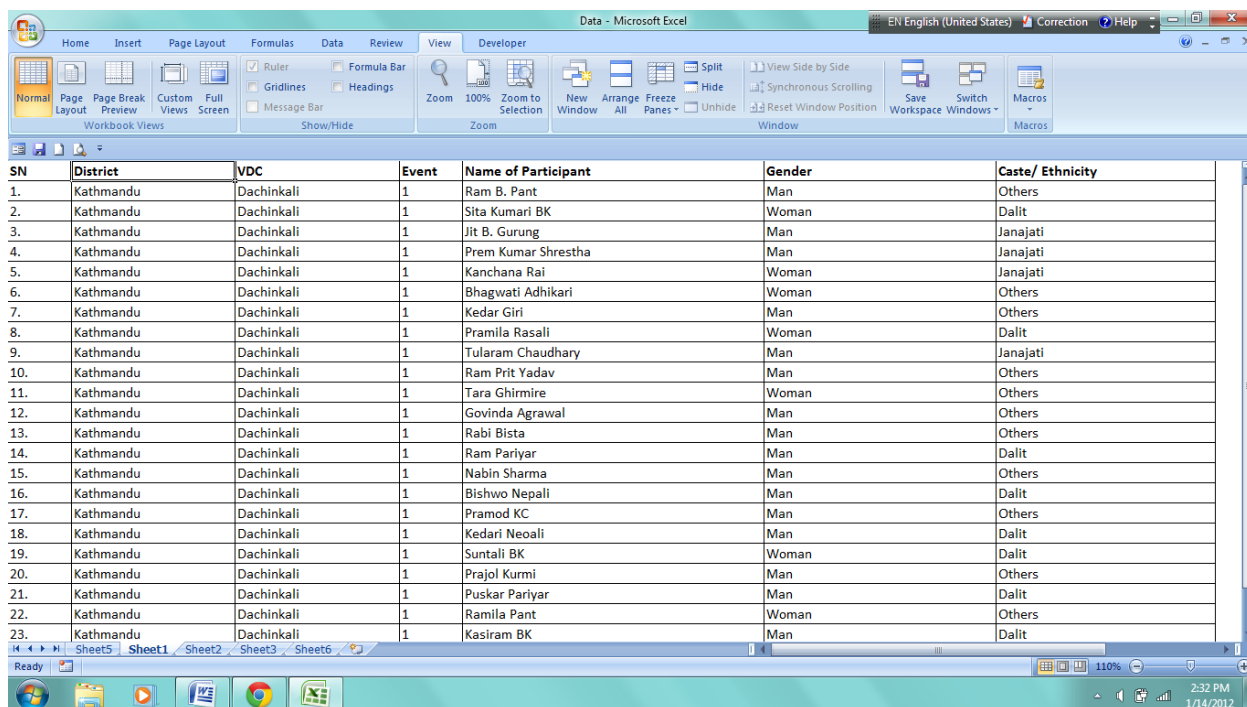


Diagram 2: template of Excel program

Dropdown menus can be added from which one can select the data for input. For example, in diagram 2 one can see that drop down menu is added in caste/ ethnicity column with data options of Dalit, Janajati or Others. One can select either of them depending on caste/ ethnicity of participants.

The menus limit the amount of typed data entry that enables faster recording and lessens the risk of typing error. Besides, dropdown menus also help to standardize the terms and restricts unwanted data entry.

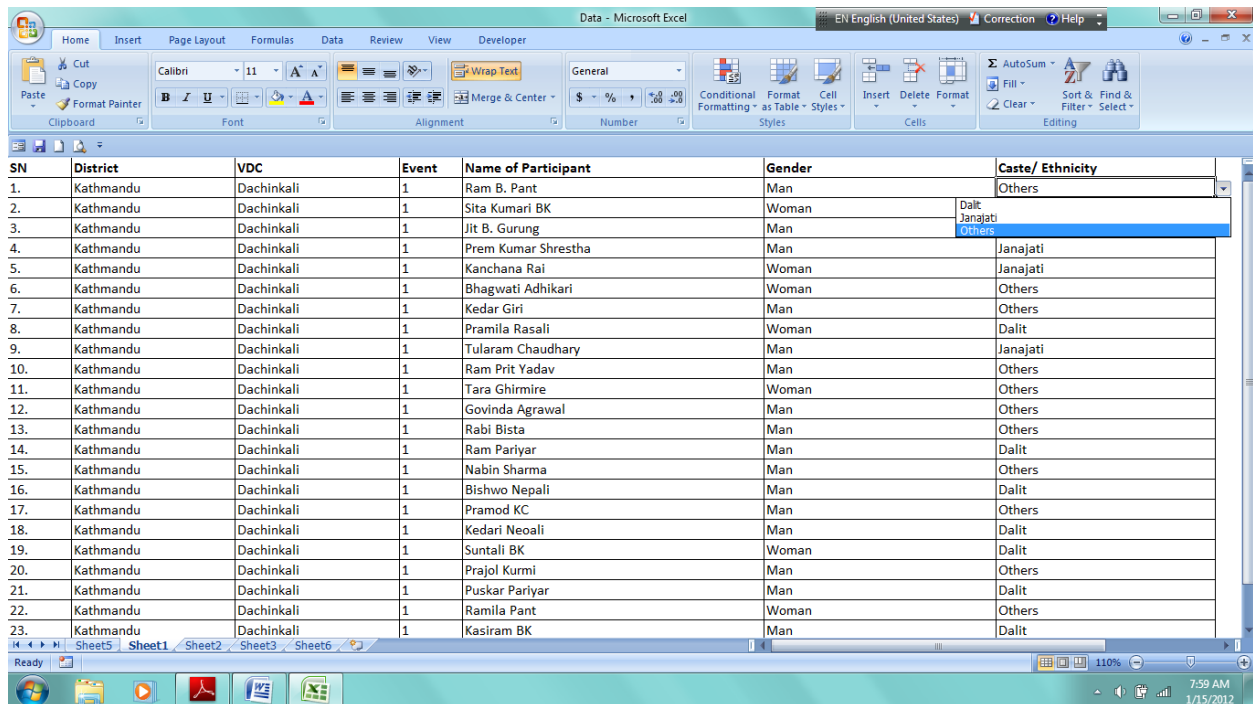


Diagram 3: Drop down feature added in caste/ ethnicity column

Once this list is prepared, one can use pivot table feature in Excel to automatically generate cross table as shown in diagram 3. By selecting 1) district, VDC and event in row levels and 2) caste/ ethnicity and gender in column levels and 3) count of gender in values in terms count and percentage of row, one can generate pivot table (diagram 4). This table can be used to generate tables 1 to 3 as above.

Using excel has the advantage of updating data at the VDC office as the training event completes and summarizing data instantly using pivot table features. Besides, the data set in excel can be forwarded to district and project offices. This allows district and project offices to further use the database for validating data and for sampling (systematically or using other techniques) the individual participants for post-training follow-up.

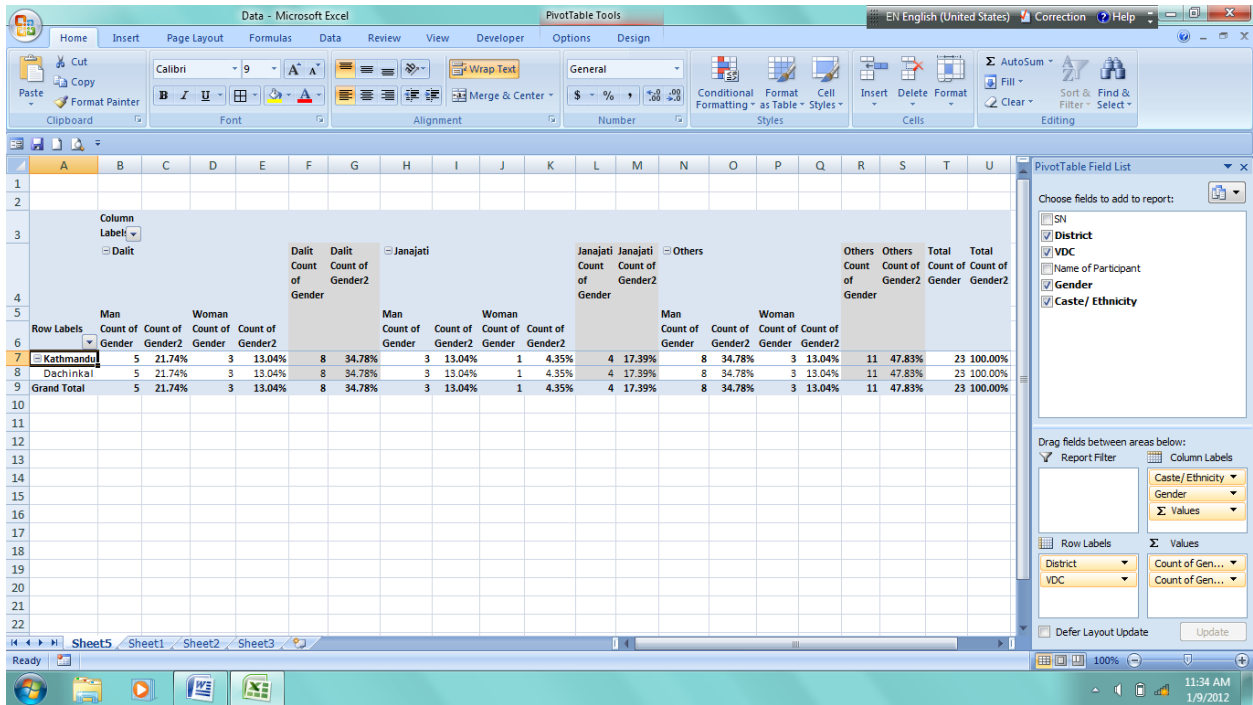


Diagram 4: Pivot table generation with district and VDC in rows and caste/ ethnicity and gender in columns

4.3 Web-based Automated System

Web-based system is tailor made and sophisticated that requires the main server computer linked through network to a set of computers where data can be entered and where data can be accessed. It facilitates instant availability of detailed database to all users that are connected to the main server. The users can view all data, but are restricted to modify data. The administrator has the authority to modify data and given access for data entry.

Diagram 5 presents an example³ of the data entry format of the web-based system. In this system, data can be entered simultaneously in all linked computers and analyzed. This system is highly automated and needs substantial budget to develop or meeting data entry, summary and analysis requirements of the project.

³ The author, as the Monitoring and Evaluation Officer, guided Yomari Incorporated Pvt. Ltd. to develop the web-based MIS for Western Terai Landscape Complex Project in Nepal.

Capacity Enhancement of Community/CBOs/NGOs

Name Of Training:

District:

Municipality/VDC: Word No.:

Start Date (yyyy-mm-dd): From To

Event Venue:

No. of Participant:

Expenditure:

Sr.	Participant Name	Address	Position	Group/CBOs/NGOs Name	Group Type	Ethnic Group	Gender
1	Rabindra Shrestha	Kathmandu	Key Position Holder	CBO	CPUG	Others	Male
2	Dinesh Shrestha	Kathmandu	Key Position Holder	WTLCF	CBOs	Others	Male
3	Shyam Chaudary	Kailali	General User	NGO	NGOs	Janaati	Male
4	Shma Tharu	Kailali	EC Member	NGO	NGOs	Janaati	Female
5	Maya Thakur	Kailali	General User	ABD	ABD	Dalit	Female
6			-Select Position-		-Select Group-	-Select Ethnic-	-Select Gender-
7			-Select Position-		-Select Group-	-Select Ethnic-	-Select Gender-
8			-Select Position-		-Select Group-	-Select Ethnic-	-Select Gender-
9			-Select Position-		-Select Group-	-Select Ethnic-	-Select Gender-
10			-Select Position-		-Select Group-	-Select Ethnic-	-Select Gender-

Reset Continue **Preview**

Diagram 5: Data entry format in web-based MIS of WTLCF

5. Conclusion

Information management system is an integral part of the decision making and programming mechanism. Its importance is on the rise with increasing need and technological options. However, good understanding and application of technology make the system functional. It is suggested to grow from simpler to more complex system as the need arises.

It is necessary to understand how data is analyzed to generate information and how information flows from implementing level to decision making levels. For that purpose, manual system is a good start for developing understanding. Certainly, automated system is more efficient than manual for analyzing data and generate information. However, without a clear understanding of what information is sought from the available data, automated system is not going to help effectively. An organization needs a system not necessarily a computer for managing information system.

An excel-based automated system is a good start for development projects considering the cost, expertise to develop and operational the system. It will be a good combination of manual and automated system. In the given exemplary case of a project providing training to communities in VDCs

of three districts of Nepal, VDC Office needs to retain the paper record of all events for data entry in the excel program and for future use. Even if data crashes, the paper records can again be reviewed for data entry. A staff trained on excel and responsible for data entry creates the required columns in excel spread sheet and enters all data records. These records are periodically updated and analyzed for reporting. If deemed necessary, the VDC office needs to provide detailed data sheet to district and project offices.

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