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Appendix A

Table 2: Health expenditure at current prices, 1980-2005 (Million Baht)

Year	Public sector							Private sector				International financial aid		Total health expenditure			
	MoPH ministries	Other	Civil servants benefit scheme	State enterprise benefit scheme	Worker- compensation fund	Social security	Total	Percent	Private health insurance employees	House- hold	Total	Percent	Total	Percent	Amount	Per-capita	As percentage of GDP
1980	4,496	2,210	860	111	100	-	7,578	28.93	224	17,160	17,374	68.88	365	1.44	25,315	644.94	3.82
1981	5,572	2,555	895	167	148	-	8,418	29.66	284	21,229	21,513	87.75	624	2.59	31,799	868.70	4.18
1982	6,952	2,834	1,219	204	153	-	11,068	31.73	318	23,109	23,427	87.18	980	1.09	34,873	719.18	4.14
1983	7,902	3,184	1,482	248	205	-	12,971	31.60	350	27,469	27,819	87.66	991	0.95	41,181	832.83	4.47
1984	8,818	3,487	1,791	300	250	-	14,426	27.61	469	38,851	37,420	71.83	395	0.76	52,241	1,036.81	5.29
1985	9,044	3,719	2,157	362	236	-	15,515	28.18	647	42,751	43,298	73.08	452	0.76	55,265	1,146.75	5.61
1986	9,276	3,965	2,564	435	221	-	16,460	24.86	630	48,432	49,062	74.27	508	0.77	66,090	1,254.78	5.83
1987	9,526	4,082	2,826	474	274	-	17,183	22.70	758	57,258	58,014	76.63	507	0.87	75,764	1,436.10	6.82
1988	10,373	4,336	3,156	529	347	-	18,743	20.83	851	69,955	70,906	78.81	518	0.35	89,988	1,848.70	5.77
1989	11,733	4,448	3,521	590	367	-	20,660	19.69	1,162	82,999	84,150	80.07	252	0.24	105,091	1,895.31	5.69
1990	16,226	4,568	4,318	723	443	-	26,265	20.86	1,403	97,450	98,853	78.89	184	0.15	125,302	2,224.04	5.74
1991	20,568	4,899	5,127	859	624	778	32,556	23.62	1,344	104,348	105,692	76.29	270	0.18	136,816	2,448.93	6.54
1992	24,604	4,840	5,854	961	753	2,057	39,089	24.75	1,775	116,745	118,520	75.03	358	0.23	157,965	2,753.20	5.59
1993	32,996	4,928	7,906	1,291	927	2,473	50,423	27.89	2,061	131,297	133,358	72.85	281	0.15	184,082	3,141.85	5.81
1994	39,319	5,558	9,954	1,868	1,189	3,773	61,441	30.73	2,307	136,047	136,354	89.19	154	0.08	199,849	3,405.40	6.51
1995	45,833	6,077	11,158	1,888	1,370	3,991	70,868	31.17	4,964	151,608	156,452	88.29	89	0.04	227,477	3,697.50	5.43
1996	55,861	7,764	13,562	2,418	1,610	6,236	87,443	33.87	6,298	183,693	188,991	86.01	55	0.01	257,537	4,307.00	5.68
1997	68,934	7,182	15,503	2,768	1,947	10,245	106,601	37.40	7,516	197,780	176,266	82.18	96	0.03	282,001	4,863.80	5.86
1998	65,085	5,740	18,440	2,817	1,630	7,637	99,329	35.98	7,803	188,878	176,679	83.99	82	0.03	278,090	4,514.50	5.97
1999	82,787	6,087	16,174	2,538	1,404	7,676	113,667	33.66	8,171	180,358	188,527	86.33	41	0.01	284,235	4,615.90	6.13
2000	83,001	4,195	17,067	1,822	1,257	8,823	116,100	32.95	7,291	193,634	200,825	87.03	72	0.02	298,757	4,852.80	6.09
2001	81,563	7,194	19,180	3,013	7,277	13,545	125,710	32.81	8,400	206,942	215,342	87.03	187	0.08	321,259	5,173.40	6.26
2002	70,923	6,884	20,475	3,081	1,220	11,223	113,806	34.06	9,734	209,889	219,620	85.80	372	0.11	333,798	5,396.10	6.32
2003	74,134	6,578	22,679	3,971	1,440	15,113	123,955	34.02	11,225	232,467	243,565	85.30	865	0.16	370,208	5,891.90	6.24
2004	77,721	7,056	18,788	4,101	1,480	15,553	126,719	32.00	12,581	252,958	265,537	87.50	1,573	0.40	392,628	6,262.80	8.05
2005	85,818	8,070	26,961	3,741	1,507	17,682	163,775	33.05	13,661	279,547	290,408	86.78	791	0.18	434,974	6,993.80	8.14

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Notes: Methods for estimating health expenditure:

1. MoPH-real figures from the Bureau of Policy and Strategy, Office of the Permanent Secretary.
2. Worker- Compensation Fund and Social Security-real figures from the Social Security Office.
3. Civil servants welfare-real figures from the Comptroller-General Department, Ministry of Finance.
4. Health spending of households and employers-figures were derived from NESDB National Income Reports; since 1994, such figures have been adjusted to include only fees for curative care, medication, and medical supplies/equipment; while the spending

on emergency care has been shifted to other service item, resulting in a drop in this category.

5. Other ministries

5.2 1980-1983 - from Financing Health Services and Medical Care in Thailand, Charles Myers, 1985.

5.3 1984-1992 (even number years) - from the Viroj Sufferings and Causes Study.

5.4 1984-1992 (odd number years) - by averaging the figures in the previous and following years.

5.5 1994-2000 - from the Bureau of the Budget.

5.6 2001-2005 - figures were derived from actual expenditure or spending as reported by the Comptroller-General's Department, Ministry of Finance, computed by NESDB.

6. State enterprise welfare

- Estimates based on a constant proportion in relation to the civil servants welfare, i.e. civil servants welfare x (based on national health account figures for 1994)

- 1996-2005 - real numbers from the State Enterprise Office, Bureau of the Budget.

7. Private health insurance

Data for 1980-1986, derived by Charles Myers from the Insurance Department.

Data for 1994, from Viroj Tangcharoensathien.

7.1 1980-1983 - from Charles Myers's report.

7.2 1984-1994 - using the ratio of private insurance to total private health expenditure, i.e. ~1.26 for 1983 and ~1.62 for 1994, and average increasing ratios during the period.

7.3 1995-2005 - real numbers from the Insurance Department, Ministry of Commerce.

8. Foreign aid

8.1 1980-1983 - from Charles Myers's report.

8.2 1984-1992 (even number years) - from Viroj Sufferings and Causes Study.

8.3 1984-1993 (odd number years) - by averaging the figures in the previous and following years.

8.4 1994-2001- data were derived from Viroj Tangcharoensathien et al. Report on National Health Accounts, 1994-2001.

8.5 2002-2005, data were derived from the World Health Organization, the Department of Technical and Economic Cooperation, and all MoPHCs departments.

Table 3: Health and drug expenditures in relation to GDP, 1980-2005 (Million Baht)

Year	GDP			Health expenditure				Drug expenditure				
	Actual values	Values in 1985 prices	Increase (percent)	Actual values	Values in 1985 prices	Increase (percent)	Percentage of GDP	Actual values	Values in 1985 prices	Increase (percent)	As percentage of GDP	As percentage of health expenditure
1980	602,482	613,723	4.81	25,315	34,916	-	3.62	-	-	-	-	-
1981	785,364	697,708	6.91	31,755	40,415	15.75	4.18	-	-	-	-	-
1982	841,509	1,018,501	5.35	34,873	42,246	4.53	4.14	-	-	-	-	-
1983	920,693	1,078,432	5.56	41,781	48,151	13.93	4.47	15,688	18,502	-	1.81	40.52
1984	988,070	1,158,353	5.75	52,241	60,187	25.05	5.29	20,629	23,767	21.87	2.06	39.49
1985	1,064,496	1,191,255	4.65	59,285	66,824	11.03	5.61	28,317	29,674	24.85	2.49	44.41
1986	1,155,397	1,257,177	5.53	66,090	73,275	8.65	5.83	18,009	20,708	30.21	1.65	28.26
1987	1,293,813	1,378,847	6.52	75,704	80,184	6.43	5.82	21,452	22,818	9.21	1.67	28.73
1988	1,559,604	1,559,604	33.29	69,969	69,969	12.20	5.77	28,674	28,674	17.84	1.71	28.65
1989	1,858,982	1,749,952	12.19	105,091	99,053	10.08	5.68	33,763	31,937	19.28	1.82	32.13
1990	2,183,545	1,945,372	11.23	125,502	111,836	12.72	5.74	35,369	31,511	-0.98	1.82	28.23
1991	2,500,635	2,111,862	8.56	136,618	118,955	4.77	5.54	39,464	33,249	-6.51	1.57	28.43
1992	2,830,914	2,202,572	8.78	157,865	127,388	8.90	5.58	42,770	34,486	3.72	1.51	27.08
1993	3,170,258	2,473,837	8.38	164,062	143,634	12.77	5.51	42,984	33,059	-4.14	1.34	23.02
1994	3,829,341	2,722,008	10.03	189,949	149,962	4.41	5.51	52,823	39,817	18.83	1.45	28.41
1995	4,188,212	2,667,542	9.02	227,477	191,255	7.53	5.43	68,437	48,514	22.48	1.63	30.08
1996	4,611,041	3,087,761	4.05	257,507	172,438	6.93	5.58	81,440	54,536	12.41	1.77	31.63
1997	4,732,810	3,002,825	-2.75	282,001	178,935	3.77	5.86	92,729	58,838	7.89	1.98	32.88
1998	4,828,447	2,715,051	-0.59	276,090	162,025	-0.45	5.97	82,888	48,643	-17.33	1.82	30.02
1999	4,837,679	2,712,800	-0.08	294,235	166,284	2.83	6.13	91,208	53,359	4.70	1.98	32.09
2000	4,923,263	2,635,881	-4.54	289,757	172,671	3.94	6.08	102,400	59,860	10.55	2.06	34.16
2001	5,133,638	2,610,838	2.82	321,238	182,108	5.47	6.26	118,757	66,184	12.22	2.27	35.35
2002	5,451,854	3,089,738	5.48	333,799	187,849	3.21	6.12	120,290	67,731	2.32	2.21	36.04
2003	5,917,365	3,278,881	6.62	310,209	204,760	8.94	6.24	144,085	79,663	17.86	2.43	38.92
2004	6,489,847	3,494,175	6.78	382,829	211,502	3.09	6.05	172,734	93,001	18.70	2.66	43.97
2005	7,087,660	3,653,433	6.58	434,974	224,213	6.01	6.14	188,331	96,047	3.26	2.83	42.84
		Average	5.70			7.72				7.52		

Source: Tables 6.15 and 6.17

Note: Since 1994, NESDB has adjusted the GDP figures.

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Table 6: Health Facilities in the Public sector, 2007

TABLE 6.6 Health facilities in the public sector, 2007

Administrative level	Health facility	Number	Coverage	
Bangkok	Medical school hospitals	5		
Metropolis	General hospitals	28		
	MoPH	4		
	Royal Thai Police	1		
	Ministry of Justice	4		
	Ministry of Defence	5		
	BMA	8		
	State enterprises	4		
	Specialized hospitals/institutions	14		
	Public health centres/branches	6877	All districts under BMA	
	Regional level and branches	Medical school hospitals	6	
Regional hospitals		25		
Specialized hospitals		47		
Health promotion hospitals		12		
Psychiatric hospitals		13		
Neurological hospital		1		
Rajpracharasri Institute		1		
Bhantraserasra Institute		1		
Chest Disease Institute		1		
Cancer prevention & control centres		8		
Drug dependence treatment centres		5		
Metta Pracharak Hospital		1		
Centre for elderly care		3		
Dermatology Centre		1		
Dental Institute		1		
Sirirajon National Medical Rehabilitation Centre		1		
Thanyarak Institute		1		
Maha Vajirakonjken Centre at Thanyaburi		1		
Provincial level (75 provinces)		General hospitals, under MoPH	70	100%
		Military hospitals under the Ministry of Defence	50	
	Hospital under the Royal Thai Police	1		
708 districts	Community hospitals (Mar, 2007)	130	91.7%	

Administrative level	Health facility	Number	Coverage
81 municipality districts	Branch hospital	1	
	Municipal health centres (Oct, 2003)	214	
7,255 subdistricts	Health centres (2008)	9,762	100%
74,456 villages	Community health posts	511	
	Community PHC centres (2005)		
	Rural	89,223	89.0%
	Urban	2,109	

Sources: 1. Bureau of Policy and Strategy, MoPH

2. Bureau of Health Service System Development, Department of Health Service Support, MoPH
3. Primary Health Care Division, Department of Health Service Support, MoPH
4. Department of Provincial Administration, Ministry of Interior
5. Department of Health, Bangkok Metropolitan Administration (BMA)

District-level hospitals are community hospitals, each with 10 to 150 beds, and located in all district towns across the country. For the past several years, community hospitals have been expanded steadily, particularly from 10 beds to 30 beds. In 2007, there are only 04 10-bed hospitals while there are as many as 408 30-bed hospitals among 710 community hospitals. The proportion of 10-bed hospitals is only 4.7% in 2007, while that for 30-bed hospitals has increased to 55.9% and the proportions of 60-bed, 90-bed, 120-bed, and 150-bed hospitals have also risen (Figure 4.10).

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Table 7: Number of private hospitals in year 2006

Number of private hospitals by number of beds and region, 2006

Region	1-10 beds		11-30 beds		31-50 beds		51-100 beds		101-200 beds		>200 beds		Total	
	Hos- pitals	Beds	Hos- pitals	Beds	Hos- pitals	Beds	Hos- pitals	Beds	Hos- pitals	Beds	Hos- pitals	Beds	Hos- pitals	Beds
Bangkok	5	57	16	412	15	673	21	1,912	20	3,318	25	9,128	102	15,500
Central	14	136	20	516	11	488	38	3,499	24	3,910	7	2,108	114	10,557
Northeast	4	39	4	112	15	716	16	1,440	4	560	1	214	44	3,081
North	6	60	6	168	7	336	21	1,798	9	1,224	2	620	51	4,206
South	6	47	5	136	9	432	5	448	8	1,289	-	-	33	2,362
Total	55	339	51	1,344	57	2,645	101	9,097	65	10,311	35	2,070	344	35,806

Source: Medical Registration Division, Department of Health Service Support, MoPH.

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Table 8: The number of distribution of healthcare service provider

Private health facilities, 2006

Health facility	Bangkok		Provincial areas		Total
	No.	Percent	No.	Percent	
1. Pharmacies					
1.1 Modern pharmacies	3,615	41.1	5,186	58.9	8,801
1.2 Modern pharmacies selling only packaged drugs	497	11.0	4,031	89.0	4,528
1.3 Traditional medicine drugstores	400	19.1	1,696	80.9	2,096
Total	4,512	29.2	10,913	70.8	15,425
2. Medical premises without inpatient beds (clinics)	3,687	21.9	13,113	78.1	16,800
3. Medical premises with inpatient beds (private hospitals)	3,603	21.8	12,944	78.2	16,547
- No. of hospitals	102	29.7	242	70.3	344
- No. of beds	15,500	43.3	20,306	56.7	35,806

Sources: 1. Drug Control Division, Food and Drug Administration, MoPH.

2. Medical Registration Division, Department of Health Service Support, MoPH.

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Table 9: Distribution of drugstores by region, 1996-2005

Region	No. of drugstores and drugstore/population ratio									
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Central	6,644 (1,290)	6,690 (1,292)	6,904 (1,289)	7,465 (1,267)	7,534 (1,266)	7,826 (1,259)	7,895 (1,254)	8,821 (1,235)	8,696 (1,237)	8,960 (1,229)
North	1,989 (1,600)	1,956 (1,614)	2,029 (1,597)	2,029 (1,598)	2,045 (1,592)	1,982 (1,611)	1,964 (1,618)	2,087 (1,608)	2,103 (1,600)	2,170 (1,544)
South	1,189 (1,534)	1,152 (1,537)	1,237 (1,647)	1,243 (1,652)	1,273 (1,643)	1,354 (1,610)	1,398 (1,593)	1,510 (1,501)	1,507 (1,518)	1,535 (1,521)
Northeast	2,303 (1,919)	2,396 (1,879)	2,378 (1,892)	2,536 (1,823)	2,253 (1,845)	2,148 (1,986)	2,166 (1,950)	2,566 (1,843)	2,574 (1,839)	2,751 (1,742)
Total	12,125 (1,493)	12,196 (1,495)	12,548 (1,487)	13,273 (1,463)	13,105 (1,471)	13,310 (1,466)	13,423 (1,466)	14,984 (1,420)	14,880 (1,420)	15,425 (1,403)

Source: Food and Drug Administration, MoPH

Note: 1. Figures in () are drugstore/population ratios.
2. A drugstore means a modern drugstore, a modern drugstore selling only packaged medicines, or a traditional medicine drugstore.
3. The Central Region includes Bangkok.

Source: Thailand health profile 2005-2007 report, Bureau of Policy and Strategy, Ministry of Public Health.

Appendix B

Relevant Carbon Emission Factors

Emission Source	Unit	Carbon Emission (tCO ₂ e)
Gasohol	litre	0.002
Gasoline	litre	0.0022
Biodissel	litre	0.0024
Natural Gas for Vehicles (NGV)	kg	0.0026
Diesel	litre	0.0027
Liquefied Petroleum Gas (LPG)	kg	0.0031
Refrigerant - R134a	kg	1.3
Refrigerant - R404a	kg	3.26

Source - IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 3, Industrial Processes

Appendix C

Green Logistics In-depth Interview Question for New model

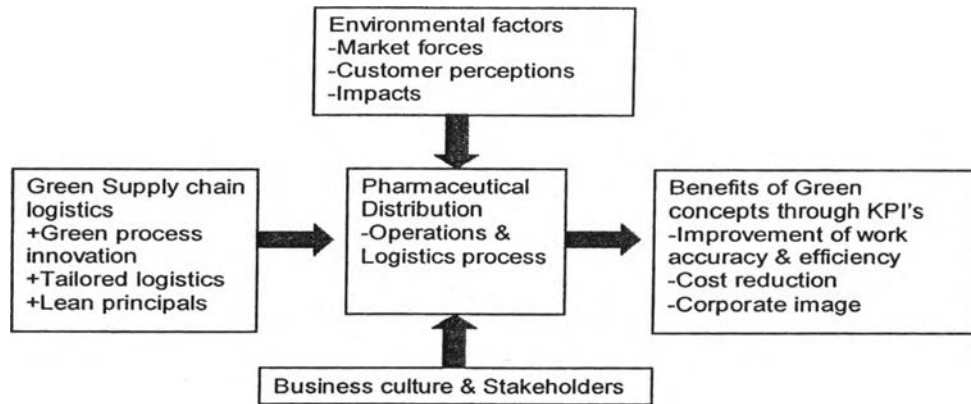
Note: Objective: Extend the green concept to business partner and conducting depth-interview

Part 1: Biography data

- 1.1 Interviewee's name _____
- 1.2 Company name _____
- 1.3 Place and date of the interview _____ Date: _____
- 1.3 Demographics: Gender: waste Age _____
- 1.4 Education _____
- 1.5 Occupation _____

Part 2: Attitude

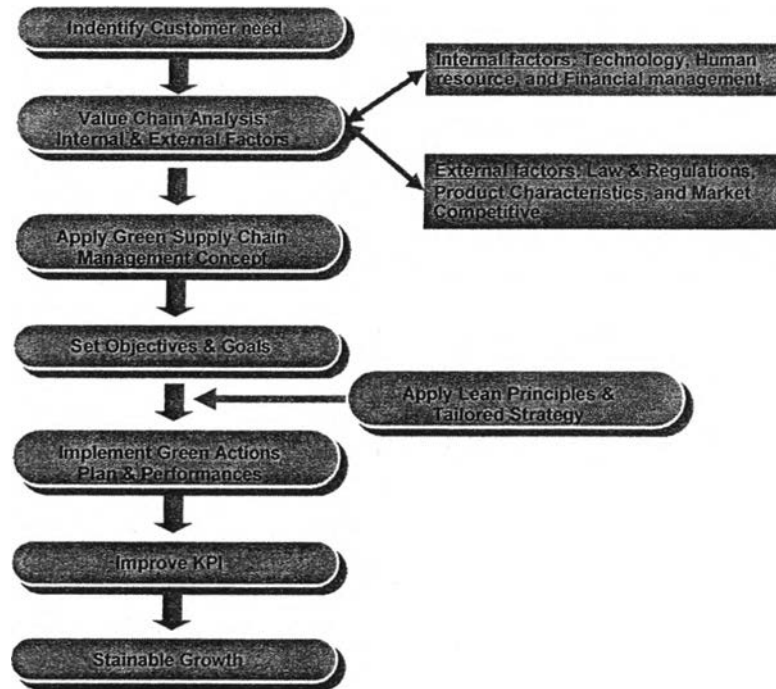
- 2.1 In your own words, could you tell me what is the Green Logistics?
- 2.2 What are the effects of your business operations toward our environmental?
- 2.3 Do you think it is important for pharmaceutical services provider to apply green logistics concept to their business process?
- 2.4 Why or why not?
- 2.5 Do you think who should take responsible to review their business process that effect to our environment?
- 2.6 What do you think green logistics takes to be successful in your organization?



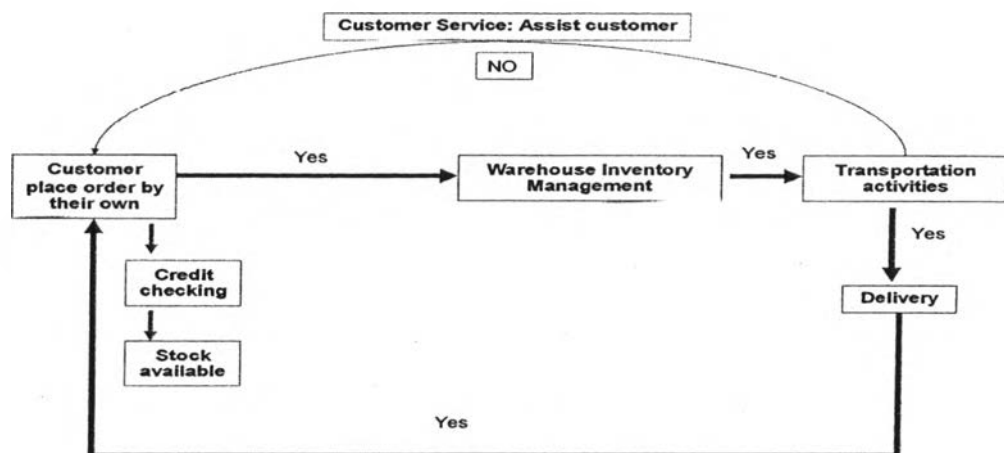
Conceptual Frame Work of Green Logistics

- 2.7 (Show the Conceptual model) How do you apply green innovation process to your operations?
- 2.8 What major problem of applying green concept have you had to deal with recently?
- 2.9 How do you solve the problem?
- 2.10 What do you think will be the hardest thing to change? What will be the easiest?
- 2.11 How do you make change and build culture to support?
- 2.12 Tell me about some of your recent green activities and what you did to achieve them?

2.13 (Show proposed model) Do you think that green logistics concept benefit to your business for sustainable growth? Can you apply this model in your organization



2.14 (Show new business model) What do you think about this new business model?



2.15 Please explain the advantage and disadvantage to apply this model in Pharmaceutical industry

VITAE

Kansiree Chaisrianurak was born on September 28, xxxx, in Chantaburi, but she grew up in Bangkok, Thailand. She earned a Bachelor's Degree in Marketing from Assumption University. Since she was especially interested in Innovation and Creativity, she decided to continue her study in Technopreneur and Innovation Management at Chulalongkorn University and recently she has earned a Master's Degree from there.

She is now working at a high reputation Phamaceutical Distributor Company, Zuellig Pharma Ltd. She plays hard on her role and achieves her goals step by step. She started working as a Hospital Relation Manger Soon after that she was promoted to be the Ordering Center Manager. With her interest in Innovation, it is going to bring her close to the dream. She is going to be promoted to be xxxxxx in the next few months.

