A Cash-Oriented Subsidy System, A New Proposal for Food-Subsidy Delivery

Ass. Prof. Magdy E. Elhennawy

Abstract - In spite of the successful implementation of the FCS in achieving its allocated objectives, there would be a need to introduce an important modification and evolution to that system. It is the ability to deliver the food subsidy as its cash equivalent. The worldwide experience says that the sudden conversion from food subsidy distribution to the cash distribution is not recommended. A combined approach should be followed, which allows the family to receive his cash equivalent as a set of products with nearly the real prices or semi-supported prices. In this paper a proposal for the cash-oriented subsidy system approach will be discussed and introduced.

Index Terms --- Cash subsidy, Smart cards, Information security , network communication.

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1. Introduction

Smart cards **[1]** have been used in several governmental applications such as identity management **[2]**, e-passport **[3]**, e-voting **[4]**, electronic fare payment **[5]**, and subsidy distribution **[6] [7]** [8] **[9]**. An automated system, the Family Card System, FCS, has been developed and implemented in Egypt by Ministry of State for Administrative Development, MSAD, in cooperation with other ministries, to deliver governmental support services to deserved families and individuals. In this paper, we describe our vision for the process of converting the food subsidy distribution system into a cash-oriented delivery system. It includes evolving the FCS which is using smart cards. We introduce a new architecture for the distribution of the food subsidy, to allow the food delivery as cash-oriented delivery system. In this paper the following topics are introduced. The introduction is presented in this section; the overview is presented in section two, while section three surveys the current FCS system, covering the system operational aspects, the system technical architecture, and the development and implementation methodology. The current system, food subsidy delivery, drawbacks have been stated in section four. The concept of cash-oriented solution applied in the FCS system have been stated in section five as the proposed solution to overcome the current system difficulties, including the proposed system specifications, architecture and capabilities are stated in section six. Finally the conclusions and future work are stated in section 7.

The Egyptian government has defined policies to provide subsidies to support its families. However, there have been obstacles in defining the families who truly deserve the subsidies as well as a need to monitor the allocation of funds to such families more accurately, and enhance the

Meanwhile, the delivery of such services to the deserved families is crucial.

The Family Card System, FCS, the electronic system developed in Egypt, have replaced the traditional system. The traditional system was no longer efficient enough to accommodate the growing population. The electronic system allowed the registered outlet only replacing goods that have already been claimed by smart card, with all transactions being electronically monitored and documented, thus eliminating waste or illegal transactions.

The electronic system, FCS, was designed to provide families with the services offered by the government; such as social pensions and health services as well as subsidized goods. The smart cards can be used at grocery stores authorized to sell subsidized goods. The family card project has provided a comprehensive database of Egyptian families which can be used by decision makers in defining the families in need, as well as tracing consumption levels and patterns across the country. The implementation has resulted in a lot of saving in allocated monthly budgets through controlling subsidies distribution. The system takes into consideration the need for constant updates to guarantee the accuracy of information. After in-depth study and analysis it was found that to be financially feasible, it is recommended to outsource the project to a private sector company, who would be responsible for the design, implementation and maintenance of the technology related to the project as well as applying high level international standards for data and process security.

In spite of the successful implementation of the FCS in achieving its allocated objectives, there would be a need to introduce an important modification and evolution to that system. It is the ability to deliver the food subsidy as its cash equivalent. The worldwide experience says that the sudden conversion from food subsidy distribution to equivalent cash distribution is not recommended. A combined approach should be followed, which allows the family to receive his cash equivalent as a set of products with nearly the real prices or semi-supported prices. This approach will be surveyed in the following sections.

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2. Overview

Since 2005, a governmental subsidized and support services delivery electronic system, the FCS, has been developed by MSAD, in Egypt, using smart card. Initially, the FCS delivered two services belonging to same governmental entity, the Ministry of Social Solidarity, MSS. The two services are the food subsidy and social pension. In 2010, MSS has decomposed into two different ministries, the Ministry of Supply and Interior Trade, MoSIT, and the Ministry of Social Affairs, MOSA. Now the MoSIT is the owner of the food subsidy service and MOSA is the owner of the social pension. Moreover, and for now, the LPG service, belonging to Ministry of Petroleum, MOP, and supported bread service belonging to MoSIT have been contracted to be implemented under the same system. The health services are ongoing to be implemented on the same system. A successful pilot has implemented using smart cards in health services delivery. All mentioned services are managed by the same system using the same smart card as a delivery tool.

The nature of the system dictates that one family may deserve one service; other families may deserve more. Furthermore, it dictates that one service may be family-based while others may be individual-based. This leads to the need to restrict managing three basic issues, namely: 1) to control the eligibility of the families and individuals to various services, 2) to control service delivery to guarantee the correct delivery of the services to eligible and deserved people, and 3) to compute and monitor the amount of subsidy allowed to each family according to the business rules, depending on the number of family members.

In this paper, we use the notion of *service owner* to refer to the governmental agency or ministry that is responsible for providing the environment to deliver a service, such as MoSIT, MOSA, or MOP. The service owner has *service providers*, such as grocers for food subsidy, bakery for supported bread. Meanwhile, the service owner has *service managers* such as supply offices in food subsidy and supported bread to manage service provider quotas. The *vendor* is the contracted company which is responsible for implementation, maintenance, repair, and operate the system. The *service coordinator* is the MSAD, which is responsible for managing and enforcing the eligibility for both families and individuals for various services, besides building the system technical architecture. It also, monitors and test various programs implemented by vendors. MSAD is responsible for build and managing the Card Management System, CMS.

3. The current FCS system, Situation-before and Situation-after

The family card system has been proposed, studied, analyzed, designed, contracted and is currently operationally monitored by the Ministry of State for Administrative Development, MSAD. The stakeholders of the system include the Ministry of Supply and Interior Trade (MOSIT), Ministry of Social Solidarity (MoSS), Ministry of Petroleum (MOP), and the Egyptian society.

The situation-before
Before the system implementation, the process of delivering food subsidy was a paper based process, which led to lack of follow up, high leakage ratios, and in-accurate delivery of the commodities to the deserved families. This process implied that, each group of targeted families is linked to a specific grocer. Meanwhile, each family is provided a paper card to receive the relevant monthly subsidy. The family used to go to the grocer, receives the commodities, and then, pays for what has been received and then signs a grocer paper document. As a matter of fact, the subsidized food are cheaper than the market prices as it is supported by government.

Accordingly, each grocer receives, on a monthly basis, the products corresponding to the total commodities assumed to all families linked to that grocer, referred to as a full quota even if the grocer did not deliver all such quotas to deserved families. The grocer prepares a monthly report stating his quota, revises it with the associated supply office, and gets approval that the full quota has been delivered to deserved people and eventually proof that what he will receive is correct. Then, the report goes to the wholesaler to receive the grocer's total quota. So, the grocer receives, on a monthly basis, the full quota irrespective if he is actually delivering all of them to the citizens or not. Eventually, indispensable commodities are not monitored and the grocer can sell them outside the system, in the black market.
Moreover, any changes that occur in the family data (new born insertion in the paper card, family address change, grocer change ...) should be registered on the paper document in the supply office, manually. The paper-based system is time consuming and gives great chances for inconsistency of registries, corruption, and mistakes. Not to mention the large storage space needed for filling such documents.
Similarly, the delivery of other services suffered the same shortcomings before the system, (same process, and same disadvantages).

The people attaining the social pension were registered and received the service manually. However, the social pension is given to families

families according to certain social criteria which, in the manual system, can be forged, consequently, non-eligible citizens can privilege from pensions. This is similar in the delivery of health insurance; it suffered the same weak points before the system. It is subject to bad manipulation and weak provision of the service.

Hence, the Egyptian government has adopted smart cards as a tool use of information and communications technology as a means to manage and control the delivery of various support services.

The situation-after
The implementation of the FCS system is the foundation of an electronic system capable of achieving a set of objectives such as: 1) ensuring delivering the food subsidy and other services to deserved people, 2) building a database for the families and citizens to support the services delivery and allows future planning and fair distribution of the subsidy over all the families, 3) the foundation of a civilized environment for service delivery, 4) expanding the smart card usage and cash-less environment over the public, and more.

MSAD has outsourced the implementation of the system to a vendor, which is in fact a consortium availing a set of components, such as: service centers to allow and maintain family's data manipulation, and call center to allow interaction with the citizens. It also avails technical support center to guarantee the system security and service provision continuity. The family database was hosted in a specialized data center, and a set of applications to achieve the system functionalities, have been implemented. The supply offices have been automated to supervise system activities, and service centers. The system was composed of a set of basic components as shown in **Figure 1**.
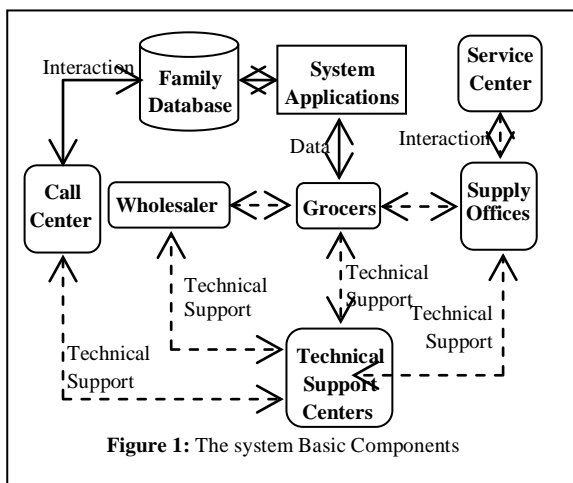

Figure 1: The system Basic Components

The centralized database receives periodically the modified version of the family database and the transactions database from the contracted vendors responsible for implementing and operating the system services delivery. To allow delivering more than one service to the family using the same smart card, the system employs a multi-application smart card technology **[10] [11]**.

A. System Operational Aspects
The family card system consists of operational components, which allows the successful delivery of services to eligible families; each family receives a smart card. Smart card contains indicators for the service allowed for that family. The grocer is equipped with a point of sale, POS, to register the food subsidy delivery transactions. Transactions are sent to the central system through the network. Accordingly, a lot of processing and many statistical reports can be issued to plan for the service delivery. **Figure 2** shows the system operational aspects.
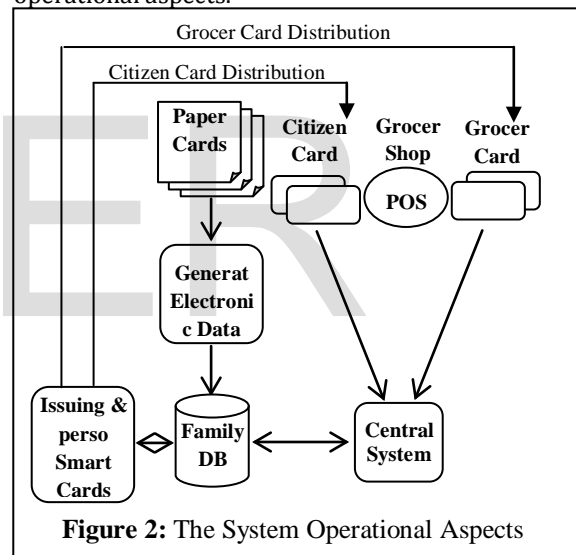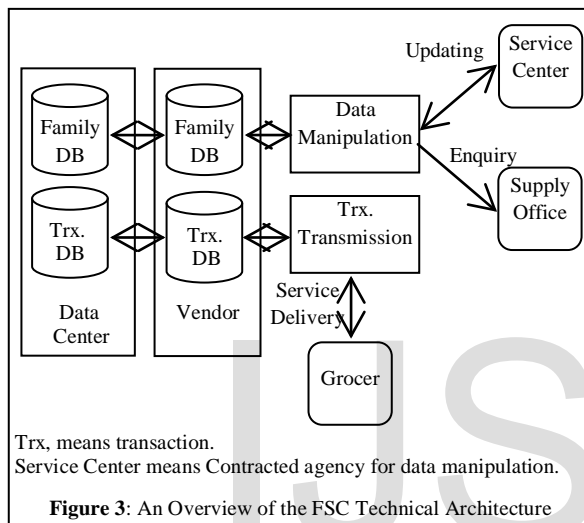

Figure 2: The System Operational Aspects

B. System Technical Architecture
To avoid monopoly, the system has been implemented by more than one vendor, each has assigned group of governorates. MSAD has studied the system requirements, prepared its specifications, and then delivered specifications to such vendors for implementation. MSAD has restored master and backup copies of family database for security reasons.

The system is a transactional processing system-based one; it records the food subsidy delivery to the families, in the grocer shop, which can be communicated to the central system, in which the system applications and database are hosted.

The applications and database are hosted in data center that provides the standard specifications needed to secure database and applications. **Figure 3** shows an overview of the system technical architecture. In such architecture, service centers can access directly data hosted in vendors to update whenever requested by family. Meanwhile, supply offices which are responsible for managing the grocers quotas and control the quantities allowed for each one of them, can access directly system for querying only. One the main issues are the separation between service provider and service manager. On other hand, the grocers POS are communicating with and sending transactions to central system.

Trx, means transaction.

Service Center means Contracted agency for data manipulation.

Figure 3: An Overview of the FSC Technical Architecture

As the family card system is a national and process critical system; expandability, system resilience, system robustness, key management and security, interoperability, and continuity, were critical factors taken into consideration during its design process **[7].**

C. The development and implementation Methodology

The Egyptian government has planned to enlarge and empower the subsidy of food subsidy, the social pension, health insurance, and other services to cover underprivileged families. The family card is geared towards achieving such goals. As a key development issue, MSAD has followed the spiral methodology to implement the system development life cycle.

The key development and implementation steps includes; the establishing of an electronic database for Egyptian families including underprivileged families, defining the overall system technical architecture, and technologies and implementation strategies. Meanwhile, software development lifecycle has been followed. Multi-application

smart cards have been employed for services delivery **[8][9]**. On the other hand, the building of the network infrastructure of the system allows all stakeholders to communicate with the system. Service centers have been built for data manipulation. Call center, has been established to receive the families' requests and complaints. Training the system users has been executed. Then, hardware and software installation and overall system launching has done. System testing was conducted to guarantee correct system operation.

4. The current FCS system drawbacks

n spite of successful implementation, good performance and the achievement of its objectives efficiently, the FCS have some drawbacks. The delivery of the food subsidy, in fact have a set of side effects due to the bad behavior of the service providers as well as due to the nature of the service provision.

First, the food subsidy distribution process should be supported with a supply chain. It needs to collect a huge amount of commodities in large warehouses. Then it needs to deliver it to service providers in appropriate times. This needs a lot of arrangements pertaining the storage places, the good storage condition and environment, the human resources to manage such processes, and finally the process to control the arrival of such commodities to their destinations are required which cost much. In addition, the storage of such commodities may lead to food subsidy spoil. **Second**, some illegal actions are done by grocers; these illegal actions may represent a burden on the family during receiving his food subsidy. **One such action** can be the entering of the family card password by the grocer, claiming that he wants to secure and safely use the POS and protect it from damage due to bad use by the family holder. This may allow him to illegally use the password later on. **Another example**, while the family holder request only part of its quota, sometimes the grocer enters the full quota on the POS, and gives the family holder the requested quotas only and keep himself the remainder for its use in black market. **A third example** that the grocer illegally ask the family for additional cost, claiming that it is for maintenance and technical support of the equipments fixed in his shop, which is a wrong claim. The FCS does not ask the family to pay anything more than legally and approved one. However and as a conclusion, the complete conversion from food subsidy to cash equivalent is crucial and heavily needed. Meanwhile, the above reasoning proves the need to convert from food subsidy to cash delivery gradually, or at least to

combine them in such a way that it can overcome the above drawbacks.

On the other hand, and according to worldwide experience, the combination of the food subsidy delivery with the cash equivalent delivery is recommended as an intermediate phase before complete conversion to cash equivalent.

5. The Concept of FCS Cash-Oriented System, the Proposed Solution

The above mentioned drawbacks dictate the needs for the application of the concept of cash-oriented system. That concept assumes to define an amount of money as a subsidy support, for each individual in the family, and allows the family to buy any set of commodities' items by that amount of money. A list of items will be available under this system that the family can chose among them. The family has the freedom to receive any number of available items with any quantity of those items, only the constraints are the amount of subsidy support money registered for that family. He has the freedom to buy more items but he should pay the value after the allowed support money. Meanwhile, and to simplify the process more to the house hold, the system can expand the number of grocers to include the supermarkets; other shops specialized in food products.

6. The Proposed System Specifications

A. The System Architecture

The proposed system architecture allows the POSs to consult a list of available items, for the family to choose his needs during receiving his amount of support. The service provider, the grocer, receives a quota of items from the defined trading companies at the beginning of each delivery cycle. The grocer delivers the items selected by the family in one of two cases, the first as part of the allocated family support (referred in the below **Figure** as items inside), the second as part outside the allocated family support which should paid cash by family to the grocer. Accordingly, the grocer should pay this value (the part outside the allocated family support) to the trading company by cash. The items delivered to the family whether it is inside or outside the allocated family support will be registered by the central system. Accordingly, the central system can issue appropriate reports to the responsible entity to manage the clearing and payment with the trading companies. **Figure 4** depicts the cash-oriented system architecture.
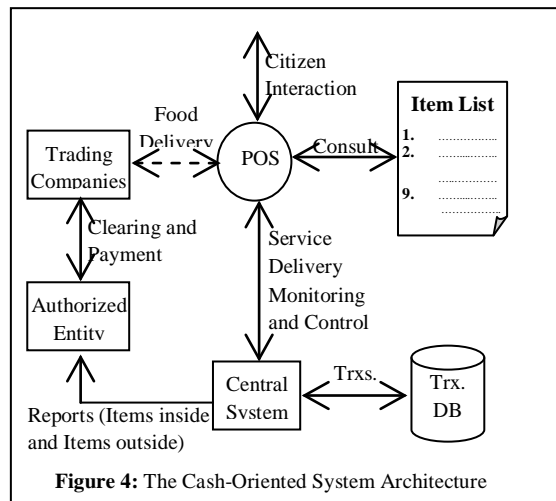

Figure 4: The Cash-Oriented System Architecture

B. The System Capabilities

A set of controls should be developed to insure delivery of the support to deserved people and the correct amount of money only which are delivered. This needs to have a correct number of family individuals. The amount of money dedicated to each family is computed as the number of family individuals multiplied by the amount allocated to each individual as subsidy support. So, the total amount of money allocated for the family is composed as:

$[HH + W + \sum_{i=1}^{n}(S_i)]$ X Amount of support per individual, n is the number of suns in the family, HH is the house hold, and W is the wife.

On the other hand, a set of reports should be issued to control the amount of commodities items delivered to grocers versus that delivered to family from grocer, classified as inside and outside the allocated family support. **Figure 5** depicts an example of a calculated family cash-oriented system amount of support.
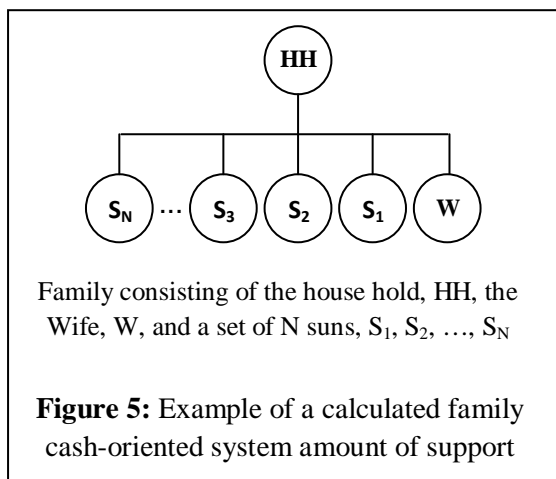

Family consisting of the house hold, HH, the Wife, W, and a set of N suns, S_1, S_2, …, S_N

Figure 5: Example of a calculated family cash-oriented system amount of support

7. The Conclusions

The proposed cash-oriented subsidy delivery system is a suitable solution that combines both the food subsidy delivery and cash delivery in a form that is appropriate to families and citizens. It allows a variety of commodities' items, offering a more freedom to the family holder to select and choose the more convenient items for him and his family. The original FCS allows only a set of predefined items with predefined prices, which limits the family holder selections. This leads to the fact that bad items are the delivered one besides the bad behavior of the grocers with the family holder, in addition to the above mentioned drawbacks. The proposed solution combines between the predefined product-prices system already exists with the cash equivalent as a set of products with nearly the real prices or semi-supported prices. A satisfaction from citizens has been received.

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