UAE National ID Programme Case Study

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Abstract—This article provides some insight into the implementation of the national ID programme in the United Arab Emirates (UAE). The fundamental aim is to contribute to the existing body of knowledge in the field, as it sheds light on some of the lessons learned from the programme that is believed to widening the knowledge horizons of those involved in such initiatives.

Keywords—national id; identity management.

I. INTRODUCTION

MANY countries around the world have either implemented, or are in the process of embarking on national ID projects. The key motives behind such initiatives is to improve the identification and authentication mechanisms in order to reduce crime, combat terrorism, eliminate identity theft, control immigration, stop benefit fraud, and provide better service to both citizens and legal immigrants (see for example: [1],[2],[3],[4]. In view of the fact that these projects are unique undertakings and involve a degree of uncertainty and risk, national ID programmes are perceived to carry a high level risk and that more knowledge needs to be acquired to understand the complexity of these types of endeavors. In this regard, this article aims to present a case study of the implementation of an ID card programme in the UAE, and to highlight some of the lessons learned which, if considered, are most likely to support the planning and execution of similar initiatives.

This article is structured as follows. First, some primary information about the programme, its strategic goals and objectives are presented. The technologies employed and the enrolment process are explained next. A short overview of the enrolment strategy is provided and then the lessons learned are presented which concludes the paper.

II. UAE ID CARD PROGRAMME

As a result of the rapid growth of the economy as well as the population over the past few years in the United Arab Emirates (UAE), the government has expressed strong determination to enhance the performance of public departments and increase efficiency, in a bid to improve the co-ordination of and the citizen's access to public services. The project which was kicked off in June 2003, aimed to develop a modern identity management system with two strategic objectives addressing security and economical requirements (see also Figures 1 and 2). The security objective evolves around the necessity of the government to have an integrated population register that will become the central reference point for the whole government for the purpose of population identification and service delivery. By employing the necessary technologies, the project develops a trusted and robust identity verification infrastructure to enhance homeland security and help the government in protecting individuals against the ever increasing crime of identity theft.
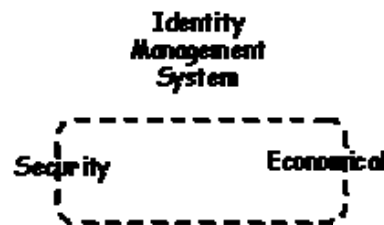

Fig. 1 project strategic goals

The second strategic goal of the project evolves around supporting the government's economy. One of the key requirements in this goal is to support the country's digital economy by building a national e-authentication infrastructure which should become the basis and the backbone for e-government services and e-commerce initiatives. Besides, having a centralised and integrated population register will assist in planning and utilising resources as it should provide timely, accurate, and statistical information for strategic decision making and long term planning with respect to education, healthcare, town planning, transport requirements, energy, etc. Another side of this objective aims to unify the existing cards in the country such as driving license, labour card, health card, and other 'entitlement'[1] cards. This will also have a profound impact on the economies of scale in the management and production costs of such cards.

[1] There are two main types of identity documents used in many countries. The first are often referred to as "foundation" documents, and they include birth certificates and immigration records. These primary documents are used to obtain documents of the second type, "entitlement" documents, such as passports, drivers' licences and other government issued documents.
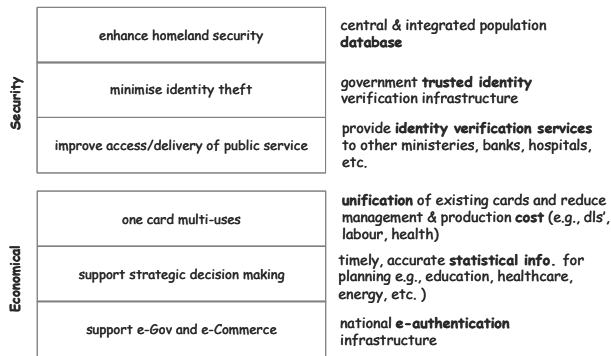
Fig. 2 security and economic objectives

III. KEY OPERATIONS OF THE NATIONAL ID SYSTEM

The national ID system incorporates the latest technological advances. It is designed based on a 4-tier web-based architecture and complies with the latest industry standards such as ICAO for card design, x.509 for PKI, and ISO 17799 for IS security policy. The system guarantees secured communication throughout the system's national network structure by using Virtual Private Network (VPN) technology and an associated technical Public Key Infrastructure (PKI). The fingerprint-based biometry provides the means to ensure a single identity for each applicant and to authenticate the identity of the ID card bearer. In principle, the national ID system is designed to provide three primary operations as depicted in Figure 3.
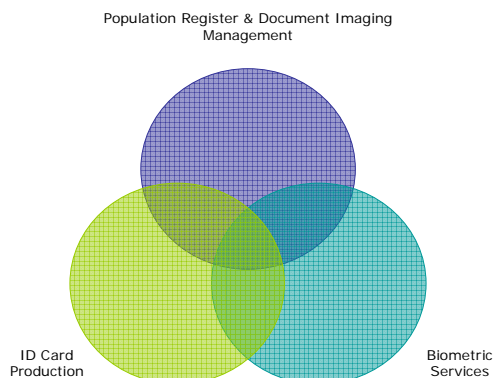

Fig. 3 primary operations of the national id system

A. Population Register and Document Imaging Management (PRDI)

The National ID system maintains the Population Register that records information about every UAE citizen and legal resident registered on the system and assigns a unique Identification Number (IDN) to each person. The system is currently sized to manage five million records. It provides the means to record events such as births, marriages, divorces and deaths, as well as the updation of variable (constantly changing) information such as address, education, employer, etc. The National ID system also stores images of the official support documents presented during the application for an ID card or on events declaration on the Population Register.

B. ID Card Production

The National ID system includes a process for the enrolment, processing, production and delivery of ID cards. This process is adapted for the first application for an ID card including the renewal of an expired ID card or the replacement of a damaged, lost or stolen ID card. The ID card produced by the national ID system includes biometric fingerprint-based authentication capabilities and uses a public key infrastructure (PKI) that is adapted for future e-government and e-commerce usage.

C. 3 Biometric Services

The national ID system provides a complete range of biometric functions using fingerprints and palm prints. The system encompasses an Automatic Fingerprint and Palm Print Identification System that provides person identification, authentication, crime solving and crime linking services. These services are used to guarantee the applicant's identity using the ID card and to ensure that a person is issued with one and only one ID card. The full set of biometric services is also used for law enforcement purposes.

IV. ID CARD

The ID card is identical for both UAE citizens and residents in terms of card design and displayed data. The card validity period is set for 5 years for citizens, and is linked to the residency permit validity for residents. The ID card includes a digital certificate with PKI capabilities. This feature constitutes one of the basis for future online identification, authentication and transactions to support e-government and e-commerce.

Fig. 4 UAE id security features

As depicted in Figure 4, it contains many security features which will make it very difficult if not impossible to forge the card and will allow in most cases a trained card acceptor to identify a faked ID card even on face value. The digital

security on the ID card chip in terms of the used signature and encryption features is accorded to the highest international security levels. In terms of the IT security in the contact chip, the UAE ID card follows the highest electronic standards, based on the use of asymmetric encryption and digital signature.

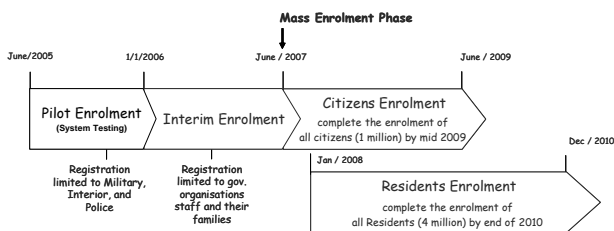## V. IMPLEMENTATION STAGES AND THE ENROLMENT STRATEGY

Fig. 5 enrolment plan

The system was implemented mainly in three phases (see also Figure 5):

A. *Pilot* Enrolment:

The first live enrolment began in June 2005 as a pilot phase in an attempt to test the system and its capabilities. This was considered to be a good starting point since many technical and business process related issues were identified that needed the system to cater for. The enrolment was stopped for more than two months to upgrade the software of the overall system to reflect the new identified requirements.

B. *Interim Enrolment:*

Although the system was ready for the mass enrolment phase towards the end of 2005, the enrolment was limited to the registration of staff of government organisations where registration centres were available, due to the incompleteness of the construction projects of the majority of the registration centres across the country.

C. *Mass Enrolment Phase:*

The registration in this phase was linked to the obtainment of certain services from the government sector such as the renewal of vehicles and passports for citizens, and the renewal and issuance of residency permits for residents. With a 3 year enrolment strategy, the project aims to register the whole population of the country by end 2010. The registration process of those new births and new residents is planned to take place directly through the Ministry of Health and Ministry of Interior who will interface with the national ID database that will initiate automatic requests such as first ID card application, card issuance, ID card renewal and replacement, and population register events declarations such as marriage, divorce, birth, etc.

VI. ENROLMENT PROCESS

Taking into consideration the criticality and importance of the enrolment process as the new national ID card will become the source document to prove an individual's identity, a robust registration process was put in place to ensure comprehensive identity verification prior to the issuance of the ID card (see also Figure 6).
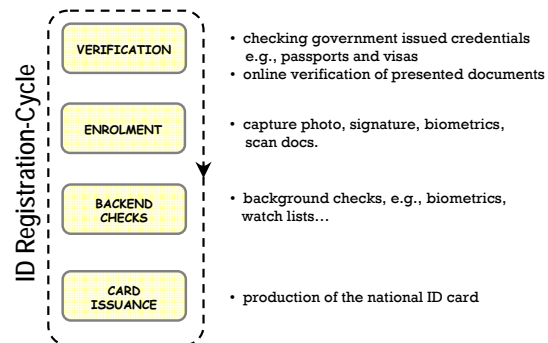

Fig. 6 registration and card issuance process

Applicants are supposed to come to any of the available registration centres with the supporting documents (application form[2], passport and family book for citizens). The applicant goes through a three staged (12 to 17 min) process at those centres. In the first office, the particulars completed on the application is scanned into the system through the 2D barcode on the form and verified against the immigration system of the Ministry of Interior online. The applicant then moves to another station where his/her photo is captured, a signature acquired using an electronic pad (which is then digitised into the system), and some supporting documents are scanned in. He then goes through the last station where his/her 10-fingerprints are captured (slaps, rolled, palm and writers' palm). The applicant is then given a receipt indicating the date he/she must return to collect his/her card or that it will be sent to him/her through a registered courier. The choice of card delivery is left to the applicant. Before the card is printed, there are other processes that run at the backend for further investigation. A biometric check is performed against civil and forensic fingerprint databases to ensure that the person has not been registered in the system previously, and is not wanted by the police authorities. In normal cases, cards are printed and distributed within 48 hours.

VII. LESSON LEARNED

This section provides a review of the current business operations in the UAE national ID card programme and presents some of the identified process improvement areas. The proposed changes are seen as key factors to increase public acceptance and project success chances.

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[2] The application form is also available for download from the Internet.

A. Registration Process

Business Process

Current   Target?

12-17 minutes   5 minutes
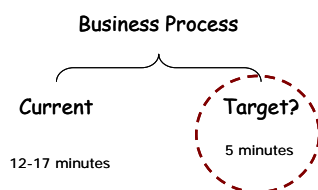
It was a concern from the early days of the project that the enrolment process involved many activities that required the project members to radically review and improve. The review exercise revealed that the average enrolment process could be completed in less than 5 minutes rather than the current 17 minutes without any big impact on the project objectives if only two enrolment activities were re-engineered: (1) the registration form and (2) the biometrics captured.

1) Registration Form

The registration form throughout the project life cycle went through many iterations in an attempt to reduce the amount of data needed for the enrolment. It started with an 8-page document, and was reduced to 6, and then to 4 pages. The form which was a pre-requisite to initiate the registration process was viewed as:

- too lengthy
- required considerable time to fill
- some information was not readily available
- was sometimes filled incorrectly
- large number of resident applicants are illiterate
- considered to be the enrolment's bottle neck

The reason for its design and the large number of data required was to achieve the objective of producing statistics about the population of the country. The review process indicated that there was a vision mix-up between the two requirements of building a statistical database and the other objective of enrolling the whole population of the UAE and producing ID cards for them. This was a clear confusion among many members and stakeholders of the project to aim to achieve these two objectives at the same time.

The recommendation from the review exercise was that the implementation of the project must take place in three stages as depicted in Figure 7. In the first stage, the project must attempt to (a) enrol the population for the new ID card with a minimal set of data as depicted in Figure 8 below. As only primary identification data will be required for first time enrolees, the application form was suggested to be eliminated and rather make use of the existing electronic link with the Ministry of Interior's database to obtain and verify data.

Then stage two and three must run in parallel. In stage two, efforts must be directed towards promoting (and enforcing) the presentation of the new ID card for identity verification and as a pre-requisite to most often visited government services by the population. Those organisations then need to maintain the new ID numbers in their databases, which should be used when moving to stage three of the strategy which requires the national ID database to interface and integrate with such databases. Provided the link is in place, a proper data warehouse can be built that is up-to-date and more reliable for generating statistical reporting purposes as it will obtain information from primary and trusted sources.
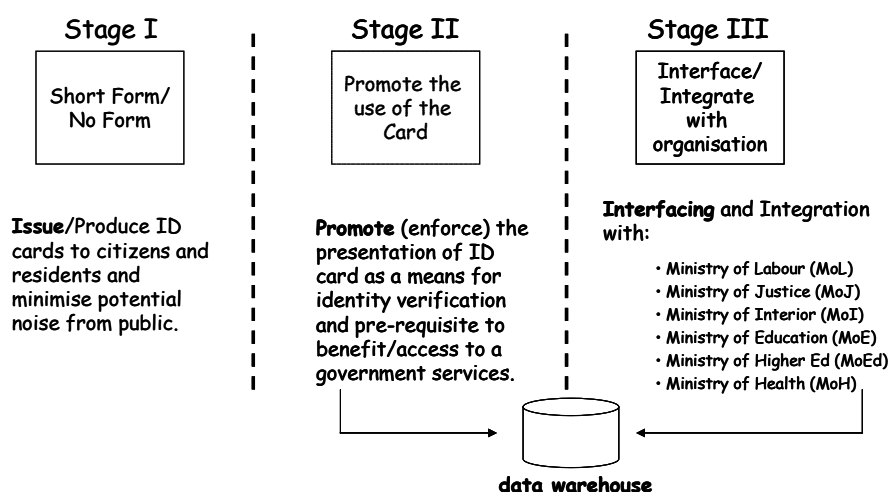
Stage I

Short Form/ No Form

Issue/Produce ID cards to citizens and residents and minimise potential noise from public.

Stage II

Promote the use of the Card

Promote (enforce) the presentation of ID card as a means for identity verification and pre-requisite to benefit/access to a government services.

Stage III

Interface/ Integrate with organisation

Interfacing and Integration with:

- Ministry of Labour (MoL)
- Ministry of Justice (MoJ)
- Ministry of Interior (MoI)
- Ministry of Education (MoE)
- Ministry of Higher Ed (MoEd)
- Ministry of Health (MoH)

data warehouse

Fig. 7 project implementation stages

Names	Name (Segmented)	Name
	Gender, DoB, Marital St.	Gender, DoB, Martial St.
Passport	Nationality	Nationality
	Passport No, Place of issue,	Passport No, Place of issue,
	Issue and Expiry dates	Issue and Expiry dates
	Unified No	Unified No, Sponsor Name
	Family ID, Book No	Residency File No, Issue and
		Expiry dates
Address	Emirate	Emirate
	City	City
	Mobile phone	Mobile phone

Fig. 8 primary identification data captured for first enrolment

2) Biometrics captured

The enrolment process required the capturing of all fingerprints (i.e., slaps, rolled prints, palm, writer's palms) a process taking around 6 to 10 minutes to complete. On the system level, only rolled fingerprints were used for identification, where slaps and palms were stored for criminal search by the Ministry of Interior. The review recommendation suggested to only capture the flat prints and use smaller acquisition devices (just the slaps and the two thumbs), and to capture other fingerprints at a later stage only if needed. It was recommended that a second biometric must be introduced to complement the fingerprint biometric and enhance the FTE^3, FAR^4, FRR^5 rates. The second biometric was recommended to be more of a real time application that could be used in mass population areas such as airports. Both biometrics were seen as easy to operate and will cut processing time to less than 2 minutes.

3) Biometrics quality

Shortly after the introduction of the pilot phase of the programme it became abundantly clear that the quality of fingerprints taken by operators will have a determining effect on the classification, identification, and authentication of applicants. Apart from possible shortcoming in the operating system itself the percentages of failure to enroll (FTE), false rejection rate (FRR), and false acceptance rate (FAR) may increase dramatically if operators are not properly trained in the art of taking fingerprints. Failure to enroll due to operator failure may for example result in false demographic information. The lesson learnt therefore was that a very high premise should be placed on a comprehensive operator training programme. It was also realised that results of biometric hits should be closely monitored to determine the performance of the system in terms of the quality of these results. A clear indication of unacceptable system performance would be if a too long hit list is required to

identity hits or if the real hit constantly appears very low on this long hit list. While it can be argued that the hit list can be shortened by tuning the applicable threshold, it will then mean that real hits that appear low on the hit list will not be identified if the systems performance is not improved. There is obviously a very close relationship between the quality of fingerprints taken and the performance of the system. It was however realised that the introduction of a second biometric will complement the fingerprint biometric and will basically balance any shortcoming.

The re-engineering of the above two enrolment processes provided a saving in the office space, equipment and staff required for enrolment as the original enrolment process was divided into three stages as depicted in Figure 9. The reason for the three office design was mainly to segregate duties, and manage the daily in-flow of applicants and shorten the waiting time.

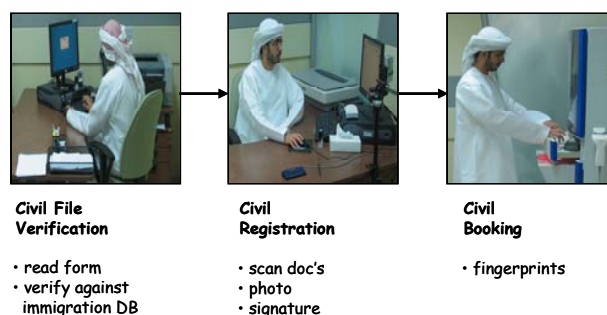| Civil File Verification	Civil Registration	Civil Booking
• read form	• scan doc's	• fingerprints
• verify against immigration DB	• photo	
	• signature	

Fig. 9 registration procedures

It was therefore recommended to enhance the system to perform the enrolment process through a single workstation. This was viewed to radically support the enrolment strategy, in which smaller devices can be used to carry out the registration, and enhance the portability of the system for wider deployment in areas such as setting up permanent and temporary registration offices in traffic departments, immigration, municipalities, schools, companies with a large number of staff members, etc.

B. Scope Creep

Scope creep is a term used to describe the process by which users discover and introduce new requirements that are not part of the initial planning and scope of the project. As widely quoted in the literature, many doubt a limited and specified scope for national ID programmes, as the nature and high cost of such projects are likely to yield and encourage the expansion of its functions [5],[6],[7],[8]. The project management literature also indicates that coping with changes and changing priorities are the most important single problem

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3 Failure to Enroll: when the system fails to enroll an applicant largely due the poor quality of the biometrics being captured.

4 False Acceptance Rate(also referred to as False Match Rate): is an incorrect identification or failure to reject an imposter (Imposter: is a person trying to submit a biometric in either an intentional or inadvertent attempt to pass him/herself off as another person who is an enrollee).

5 False Reject Rate (also referred to as False Non-Match Rate): is the failure to identify or verify a person.

facing the project management function [9],[10],[11]. Indeed, changing targets all the time, would obviously take any project nowhere.

Time

Budget   Scope
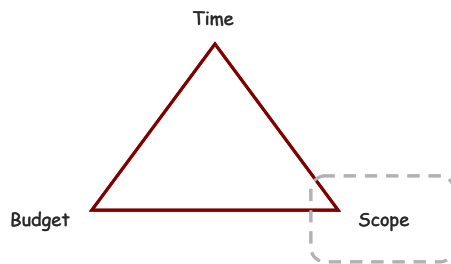
In the UAE ID programme, project performance was monitored and measured regularly to identify variances from the project plan. It was supported with a formal and well-defined process to control and manage the changes being requested to the project scope and objectives during the project lifecycle. See for example Figure 10 that depicts an example of one of the change control policies.

Type of Change			
	Technical nature (No financial impact)	Technical nature (With financial impact)	Contract Scope (No financial impact)	Contract scope (Financial Impact)
Steering Committee	Accept or Reject	Analyse and Recommend	Accept or Reject	Analyse and Recommend
Change Control Board		Reject or Recommend to Project Sponsor		Reject or Recommend to Project Sponsor
Project Sponsor		Approve or Reject		Approve or Reject

Fig. 10 change control authorities

Despite all the efforts put into managing and controlling change, the changes introduced and processed dragged the project schedule far away from the original target date. It was common during the different implementation stages of the programme to change the scope to either add new or change agreed functions, which obviously had severe impact on the implementation project plan and budget. Examples of such changes included the shifting from centralised card printing to decentralised, upgrading the card technology, changing card design and displayed data, upgrading database technology, etc.

Another example of such changes to project scope was related to the perception of the multi-purpose functionality. Several attempts were made from certain key stakeholders of the project to expand the card applications during the execution phase that had severe impact on the project progress. It took some time for them to realise the importance of limiting the purpose of the card as an identity document in the first phase of the project and that efforts must rather be concentrated on the enrolment of the population and the issuance of the new ID card.

Indeed, a multi-purpose card was one of the objectives of the project, but not in the way it was comprehended. The Multi-purpose term stated in the objectives was used to explain that the card can replace other identity documents when it comes to the verification of identities. Since the card was obligatory to the total population of the UAE, the provision was that the new ID card can replace such cards if the other entities use the new ID number in their databases as a primary number to retrieve individual records.

The management of scope in the UAE ID card was clearly one of the biggest challenges that required the project core team to spend a lot of time and effort to clarify the feasibility of such actions to the upper management. Finding the right communication approach was key to managing scope creep.

C. Too Much Security

It was during this evaluation phase of the project (discussed next) as well as the experience gained after the introduction of the pilot phase that it was realised that far too much emphasis were placed on security issues which rendered the operating system a closed system which required costly and extreme efforts to affect even simple changes. Needless to say that required changes to the system became a very cumbersome task with unacceptable cost and time frames associated with each change. This resulted in a strained relationship with the vendor as these delays were perceived by the client as to reflecting on a possible inability or lack of co-operation from the vendor. It was later on realised that the system security, security during the enrolment process and security around information included in the card itself should not be of such extent that it places a stranglehold on the flexibility to change and the user friendliness of the system. While security features built into the card body could be as inclusive as is required, the personal information of the applicant stored in the security portion of the card should be protected but should be freely available to authorised users.

D. Evaluation Framework

Since the UAE national ID system was provisioned to become the most critical system in the country as the main central hub for population identity cross checking and service eligibility (i.e., online with 24/7 availability requirement), it was important that the overall system goes under a thorough quality evaluation. As widely quoted in literature that one of the principle causes of information system failure is when the designed system fails to capture the business requirements or improve the organisational performance (see for example: [12],[13],[14],[15],[16]. Figure 11 shows an example of how a user's requirements might be interpreted during the lifecycle of a project which is not really far from being true in many of the IS projects implemented around the world.

During the UAE progamme implementation there was no clear communication of the development standard followed by the vendor, which created confusion among the project team

members when it came to individual deliverable acceptance, as well as the final acceptance of the system. In general, the project team, with the workload and responsibilities put on them, seemed to be overloaded and to have scattered visions of how things should be done and achieved. Everybody wanted the project to be concluded as quickly as possible and was seemingly very impressed with the work produced by the vendor.
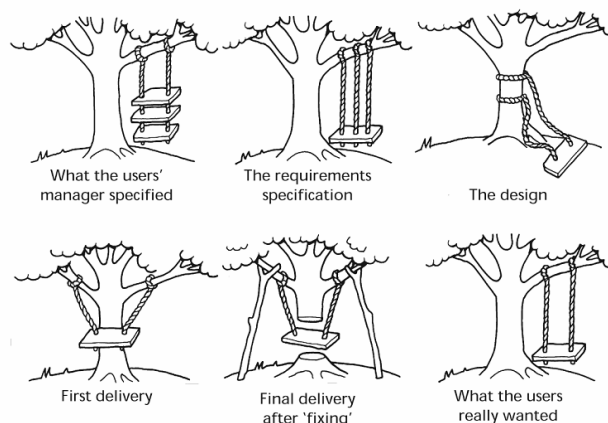
Source: [13]

Fig. 11 An example of varying interpretations of user requirements

vendor to address prior to the final acceptance and handover of the system. Besides, the use of quality framework provided a very useful and supportive methodological approach for going about software quality assessment. It acted as a comprehensive analytical tool and provided a more thorough view of the system's strengths and weaknesses. It addressed a wide range of quality characteristics of the software products and processes enabling better description of software quality aspects and its importance. Arguably, if used as a guide in an early stage of the project it could have provided a sound basis for informed and rational decision making which could have contributed significantly to the delivery of a system which is properly addressing user requirements.

VIII. CONCLUSION

Not much has been written about National ID systems implementation from a practitioners' point of view. The literature was found to be full of articles from the private industry discussing advanced technologies and what can be achieved through them. This article adds to the current body of knowledge in the field, and is believed to assist in widening the thinking circle of those who are wearing similar hats. As indicated in this paper, much could indeed be achieved through national ID programmes. However, agreed vision and thereafter proper planning is essential to succeed with
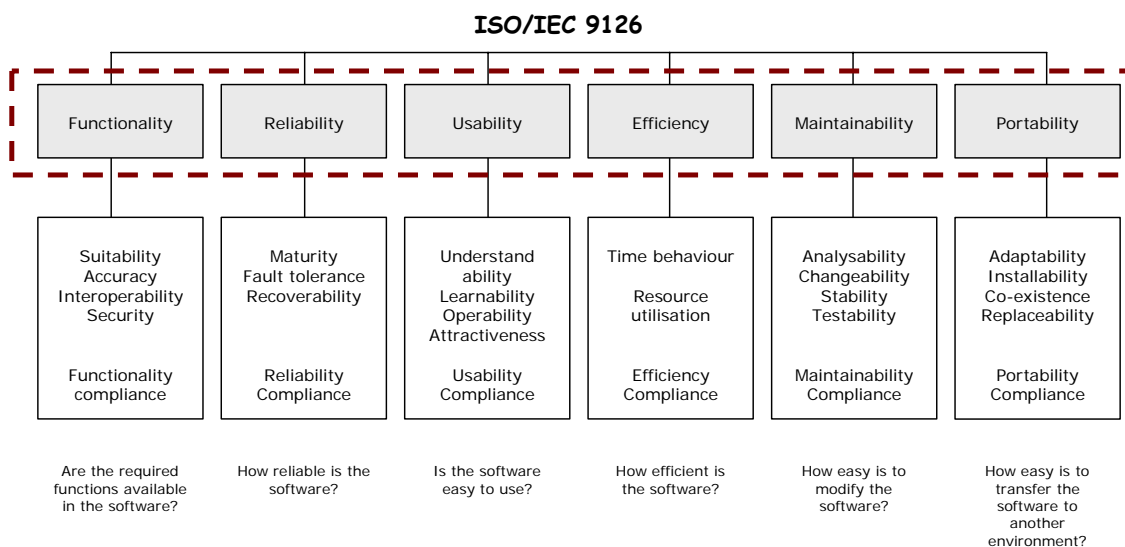

Fig. 12 ISO-IEC 9126 quality model

At the very late stages of the project, the core project team employed ISO 9126 standard for the purposes of software quality and the overall system architecture evaluation (see also Figure 12). The evaluation study contributed significantly in identifying many of the system deficiencies that required the

such projects. It took quite some time before the team started to agree on the fact that the first phase of the project should focus on the enrolment of the whole population and the issuance of the new ID card.

National ID programmes and because of their nature, are perceived to invest quite significantly in technology upgrade

and R&D departments for future developments in areas related to identity management and to keep up with the ID industry developments and standards. It was learned that new functionalities and upgrades must be thoroughly studied and researched to eliminate unnecessary changes during the execution phase.

As it is becoming the trend, such programmes need to put much effort in promoting e-identity and e-verification services using the new ID card. It would be interesting to measure the impact of national ID programmes on the overall government economy, as it would obviously promote electronic transactions and would also encourage government organisations to streamline their operations and make use of the secure (e)verification infrastructure that it will provide.

A. Further Research

Further research and practical work in this field may further contribute to the body of knowledge. Areas in which further research may yield valuable insights and better understanding are:

1) similar studies of national ID implementations that could show the appropriateness of the items presented in the lessons learned, and the degree to which it can support similar initiatives,

2) an investigation of the suitability of quality models in national ID programmes and projects of such nature and its impact on the project success rate.

ACKNOWLEDGEMENT

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