

## Digital Pen and Paper; A practical Quick win for Hajj

### Automation Needs

## استخدام الورق والقلم الإلكتروني كوسيلة سريعة وفعالة لاحتياجات

### الأتمتة في الحج

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### الخلاصة

يعتبر الحج واحدا من أكبر التجمعات البشرية الموسمية في العالم حيث يجتمع ملايين المسلمين من أقطاب المعمورة في أيام معدودات على بقعة مباركة ليؤدوا مناسك فريضة الحج مما يستلزم من حكومة المملكة وقادتها وشعبها توفير أقصى درجات الراحة لضيوف الرحمن.

ويلزم لقادة مختلف قطاعات الخدمات المقدمة للحجيج توافر احصائيات دقيقة تساعد على أخذ القرارات اللازمة في الوقت المناسب ولتؤهلهم لتقديم أفضل الخدمات وللإستعداد للوقاية من الكوارث لا سمح الله.

الهدف من هذا البحث هو نشر تجربتنا في استعمال وتطبيق الورق والقلم الإلكتروني في قطاع الخدمات الصحية في موسمي الحج السابقين والنظر في فعالية إمكانية تعميم ونشر هذه التجربة الناجحة للاستفادة منها في قطاعات الخدمات الأخرى.

تم تصميم نماذج الأوراق الإلكترونية بعد تحليل خطوات وإجراءات العمل المرتبطة بخدمة المريض اثناء زيارته للمراكز الطبية في الحج بدءا من الاستقبال وحتى استلامه للدواء وخروجه بعد العلاج بحيث يحافظ على إجراءات سير العمل ذاتها ولكن مع إمكانية حفظ البيانات التي يكتبها الطبيب وغيره من المستخدمين على الورق لتدخل مباشرة الى قواعد البيانات عبر القلم الإلكتروني. بحيث لا يكلف المستخدم بإجراء أي عمل اضافي غير العمل الروتيني المعتاد عليه -وهو الكتابة على الأوراق - . تجمع هذه المعلومات من قواعد البيانات في برنامج خاص للذكاء الاصطناعي ليقوم بأرشفتها وتحليلها انيا ليقدمها من خلال تقارير ورسوم بيانية على لوحة تحكم تفاعلية للقيادة وصناع القرار. ويتم تحديث هذه التقارير والبيانات ليا كل عشرة دقائق على مدار الساعة.

## الاستنتاج

لقد استطعنا بتطبيق الورق والقلم الالكتروني في قطاع الخدمات الصحية أن نحافظ على قدر كبير من نفس اجراءات العمل المعتادة وعدم اجراء تغييرات جذرية مما ولد تقبلا غير مسبوق من المستخدمين للتقنية الجديدة وبدئهم باستعمالها بعيد دقائق معدودات من التدريب بل وترحيبهم بها وانجاح الإدارة في تقديم وتمير نظام أتمتة جديد دون أي معارضة كما هو المعتاد. وموازيا لهذا النجاح على مستوى المستخدمين كان النجاح الأكبر على مستوى القياديين بمساعدتهم على معرفة ما يجري في أطراف المراكز الصحية أولا بأول وجمع كافة المعلومات اللازمة وإعادة صياغتها من خلال مؤشرات تفاعلية تساعدهم على صناعة القرار انيا.

ان تطبيق مثل هذه التقنية كان تجربة أثبتت نجاحها وفعالية استثمارها في خدمة ضيوف الرحمن ونعتقد أنه يمكن الاستفادة من هذه التجربة للنظر في تفعيلها في قطاعات الخدمات الأخرى في الحج.

## شكر وتقدير

نتقدم بالشكر والحمد لله عز وجل الذي مكننا من أن نحظى بشرف المساهمة مع غيرنا في تقديم فكرة جديدة وتحويلها الى واقع يساهم في خدمة ضيوف الرحمن. ثم بالشكر للأطباء ومزودي الخدمات الطبية الذين شاركوا في شرف خدمة الحجاج وعلى رأسهم القائمين على وزارة الصحة وللرؤيا وبعد النظر لقادتها ولدعمهم المتواصل الذي مكننا من نقل الفكرة الى أرض الواقع والى كل من يقف وراءهم ومعهم بهدف تقديم أفضل الخدمات لضيوف الرحمن.

والله من وراء القصد.

## Abstract

Hajj is the world largest mass gatherings where millions of people of different backgrounds coming from all over the world gather over a few square kilometers land, representing a major responsibility to all service leaders in Saudi Arabia to assure the optimal comfort for guests of Al-Rahman during their Hajj.

Real-time accurate statistical data is crucial to enable leaders to make proper decisions assure best service delivery and to prevent disasters.

The purpose of this paper is to report on the findings of the experience of application of digital pen and paper technology in health care service sector and consider the feasibility & expandability of such experience to other service sectors.

The workflow data associated with patient-doctor encounter starting with the reception of the patient till discharge, is captured and made spontaneously available to a business intelligence tool that represent such data in statistical accumulates and

translated into graphs which in turn is presented on a dashboard to medical leadership for in-time decision making.

## Background & Significance

All Saudi Ministries have major burdens during the Hajj season: where they have the duty & commitment to provide the pilgrims with the best care facilities and services. All Ministries have to mobilize resources to deal with the increased high-load associated with the busy Hajj period, to keep alert to combats any potential disasters & require real-time monitoring of services provided.

For the Ministry of Health in particular continuous monitoring & statistical analysis is essential for Planning and management [1-7], especially for quality Hajj health services, and to combat any health disaster: such as infectious outbreaks, fire, natural disasters.

Until Hajj 1432, statistical reports were not real-time and accuracy was less than optimal due to human error: Patient encounters were recorded using ordinary paper. Retrospective Statistical analysis was done few months later. In search for a new approach that would provide more user-friendly, less labor intensive, more real-time method to collect data and represent them to decision makers in Hajj season right on the spot, several new technologies were examined. The feasibility of digital pen and paper technology was proposed based on the assumption that the training curve would be easier since it resembles the old classical paper approach.

## Implementation & Technology Used

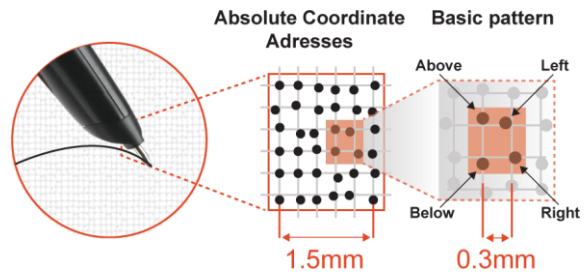
During the service provider ( e.g Doctor) encounter with the Hajji patient, the service provider simply write on a form of special paper that has a unique dot pattern printed on it to facilitate stroke capture by the miniature camera hidden in the digital pen.

Camera



The pen Camera just behind the Ink cartridge records the strokes on the paper

The special pattern on the paper not recognized by the simple eye, but recognized by the camera, tells the software where the stroke of the ink is actually taking place on the paper and capture this information in relation to space and time.



By performing what is considered to be a natural straight forward writing process, data is captured by the digital pen, recording the exact stroke shape and location, while time stamping those pen strokes.

The pen has a memory that allows it to capture hundreds of paper forms, this data would be send to the server on intervals upon what is known as synchronization.

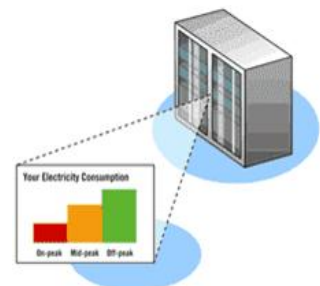
As the digital pen is put in its docking station, data will be transferred automatically from the pen to a remote server.



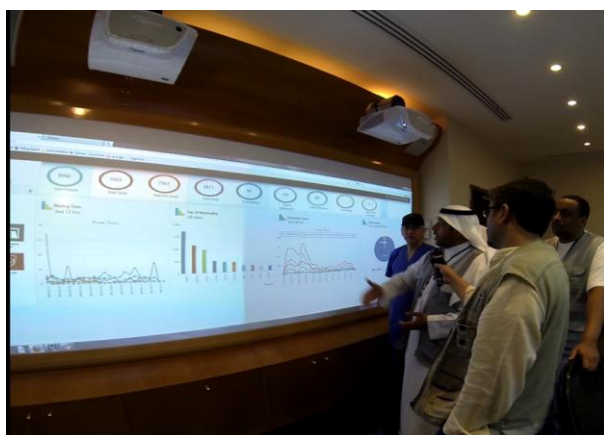
This usually requires a Personal Computers (PC) USB port for synchronizing the data captured from the pens, in the last Hajj we replaced the PC's by USB server device, without the need for a computer beside the pen resulting in significant reduction of the cost.

The Pen camera codes the stroke location into the memory, after transferring this data to the server the data is decoded to recreate the stroke on a similar e copy of the paper used to write on; by doing so the e-restructure e form looks like a scan of the original paper.

In addition to that the data is analyzed to the corresponding data fields, check boxes translates service provider ( e.g Doctor's) strokes on paper to data entry field choices on a backend software application, those data now can be sent to the database. Free text strokes has to be subjected to OCR (Optical Character Recognition) & is still to be verified before entering it into database.



Data uploaded in a structured format to the digital pen server, would then be processed and sent to the data repository, from which a business intelligence software would start to build statistical data graphical presentation from the accumulation of data collected from several hospitals or primary care centers. A friendly graphical user interface was developed to provide healthcare managers and decision makers a handy multi-touch interactive dashboard to view cumulative patient data.



## Conclusion

The application of digital pen and paper technology was able to utilize the existing workflow processes with almost no *or minimal* changes needed. Resulting in unmatched staff acceptance, with almost no learning curve needed for users to adopt it, requiring almost No change management from the perspective of the managers. Yet the return of investment was humongous from the perspective of the value added to the leaders, decision makers and Hajj guests.

Application of such technology was a great success and excellent return of investment to support Hajj healthcare services.

Such experience and such success is easily replicable to other services sectors of Hajj.

## Acknowledgments

The authors wish to thank Allah for giving us the guidance & opportunity to participate in servicing his guests. We then wish to thank the clinical staff that participated in patient care, and to thank the Saudi Ministry of health leaders for their vision and support in applying such innovative technology to serve the health care of Al-Rahman Guests during the last two Hajj seasons.

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