Using Empathy Approach to Design Type-2 Diabetic User Persona

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Abstract - Empathy approach can be utilized as a tool to uncover sensory information. It also uncovers the experience of target-audience and builds a better understanding of their behaviors and concerns, incorporating them as user-profiles and personas. Modern technology draws a lot of success from how relatable it is to the average person, when designing an interactive technology, the human element is of the highest significance. To develop usable, high efficient and user-friendly application, we must understand, capture and analyze the essence of target audience issues and concerns. This helps the development team to cognitively imagine and communicate how the end-user will interact with the proposed design in a meaningful way. Type-2 diabetes is unquestionably a life-altering incident; to be able to fully understand it, one must focus less on the technical aspects of the issue and more on the human aspects. This research paper adopts an action ethnography approach to create a degree of empathy for diabetic users; bring attention to the significance of health related characteristics for type-2 diabetes personas and demonstrate the process and usefulness of these tools in user requirement gathering, design and implementation planning.

Keywords—empathy approach; persona; type-2 diabetic; user-centered design methodology, qualitative technique

I. INTRODUCTION

Diabetes is a progressive chronic condition that is rapidly evolving into an epidemic globally. According to the World Health Organization (WHO) estimates, diabetes claimed the lives of 1.5 million people in 2012 and afflicted 9% of the adult population aged 18 years and above in 2014 [1,2] . Mathers & Loncar [3], predict that the condition will be the 7th root cause of death by 2030. Diabetes is a hyperglycemic syndrome characterized by polyuria, polydipsia and polyphagia [4]. The disease is a leading cause of cardio-vascular complications, renal failure, retinopathy, nephropathy, neuropathy, and psychological health problems [4].

In the year 2014, 3.2 million people in Malaysia were living with diabetes and 34,422 succumbed to diabetes related complication [5]. According to IDF [5] estimates, diabetes costs per person amount to 570 USD yearly. Given the substantial health, economic and human burden of the disease, there is an urgent need to find improved methods of preventing, detecting and treating diabetes. E-health technologies are presented as enablers in diabetes prevention and care. They can facilitate better patient-provider communication; provide persuasive and interactive information tools to boost patient knowledge and self-management and can also strengthen physicians/patient efficiency through evidence based tracking and recording tools[45].

At its core, appropriate diabetes care constitutes a number of multifaceted aspects: insulin management, nutritional therapy, fitness and exercise regimen, weight management, blood pressure control, frequent patient monitoring as well as consistent information and communication dissemination between patients and providers [21]. This well-established and uncompromising treatment plan can take a huge toll on patients psychological and mental well-being especially newly diagnosed diabetes patients who have to suddenly overhaul their long-standing routines and deep-seated lifestyle behaviors in order to manage diabetes. Diabetics experience numerous difficulties and dilemmas such as: difficulties comprehending and accepting their condition; financial constraints; fatalism; real or functional analphabetism due to a dearth of relevant information or a maze of confusing and mixed message information; depression and lack of motivation [22].

E-health services for diabetes care have been implemented with varied success due to cost implications, poor reception and in apropos design of applications. There were over 20,000 health apps in popular app store in the year 2014 and over 1000 of these apps are diabetes related [3]. However, 70% of the apps have achieved minimal success with only 30% of the app managing to obtain 90 days user retention [3]. Studies have also revealed disparities between the implied advantages of M-health apps and real outcomes of mobile health apps. The medical sphere has been particularly skeptical and resistant to the adoption of M-health applications due to the perceived low benefits of these apps [23].

One of the underlying factors that have contributed to the failure of mobile health apps is the design of one-dimensional models based on a generic; one-size fits all approach [24]. Applications grounded on this principal assume that

information on specialty-diseases like diabetes is transferable to each and every patient afflicted by the disease and therefore simply provide general-purpose information. Such apps fail to consider the users socio-cultural context, psycho-social factors, needs and preference which have a bearing on how users interact with medical devices and information. They also lack human-centeredness with users occupying a peripheral position during the design, development, implementation and evaluation of the application [23]. Hence, diabetes management approaches should therefore embody multifaceted strategies rooted in psychology, sociology, pathology and behavioral change [33]. In order to design products for the type-2 diabetes patients, it is vital to understand and regard their characteristics. Disregarding patients' characteristics needs and emotion will probably result in a product with low acceptance level.

The objective of this research paper is to leverage user-centered design (UCD), particularly empathy approach to drive the creation of user-personas for type-2 diabetes. This would be used as design tools to facilitate the designing and the development of a highly usable mobile-based application for self-monitoring and management of diabetes. This research paper adopts an ethnography research and aims to (1) understand the cognitive structures and behavior that drive patient's thinking and health decision; (2) enhance and complement the traditional user-profile and personas techniques for consume health technology (CHT) design; (3) create user-personas of a narrower spectrum of health care receivers of sensitive nature, self-management of chronic diabetes, with end-result being the creation of personas that can be utilized as a building-blocks for those considering the design and the development and evaluation of CHT that aims at helping similar samples; (4) demonstrate the user-profile and personas' effects on the overall decision-making process involved in the development of a diabetes self-management technology [37].

II. BACKGROUND

A. User-Centered Design

A set of methodology has been developed, known as, User-Centered Design (UCD). UCD is a combination of the human-computer-interaction (HCI) design and multi-stage problem solving process. It is an analytical procedure that gauges the requirements, needs and constraints of the end-users [48]. The result of the analysis will then be utilized to produce a preliminary model to be prototyped and tested. Empathy, user-profile and user persona are the common UCD techniques in grouping end user requirements. In health care informatics, empathy and user persona data are rarely used [47] in consumer health technology (CHT) researches. Researchers claim user personas can be very beneficial in: preventing designers from grounding themselves; by understanding users' mental models: and guide the development team to mentally visualize and feel how the intended end-users will interact with the proposed design in a meaningful way [34, 35]. Empathy and personas can be utilized as a feature of a whole UCD methodology or to enhance current process by bringing user-centered thinking whenever the design and the development process is being used [36].

B. Personas

User-centered approach puts its focus on the users and more particularly the user types. These are often called personas or user profiles and it is one of the ways to comprehend the user's requirements. Personas, though fictitious characters or persons selected to represent larger set of people or group in terms of needs, goals and other personal features [9,10], they are founded and based on real users' knowledge and experience. In creating personas, there is the need for a comprehensive user research to ensure target audience is duly represented instead of writing from a subjective angle or personal idea of the writer [11]. Personas as described by Cooper [12], is a way to include viewpoints from different end user groups without following the one-size-fits all approach or falling into the trap of using a generic user. This being said, personas are created from a field of research, whether it is a large complex project that might require ethnographic research or a standard commercial project that requires user interviews. Both provide a sufficient source of information about end-user requirements. There are many ways to represent these sources of information as a persona. They are usually represented in narrative forms which are structured ways of typifying of users in textual and pictorial formats. The primary goals behind narrative forms are: (1) to treat the personas like a real person and bring the user to life, providing a specific target to aid designers and developers in designing a final product and (2) to provide a vivid story concerning the needs and goals of the persona in the context of the product being designed. Thus, the initial step of the narrative of a persona starts with a description of the type of individual that a persona is; likes and dislikes; demographic and geographic profiles combined with psychographic and behavioral profile [12, 13]. Concisely, personas has shown significant results in creating successful products and services, despite the fact that they have been criticized for being ground in informal and unscientific data; for being difficult to implement or preventing designers from contacting real users [14]. However, personas have many benefits such as [12]: (1) allowing the development team and other stakeholders to find a common ground of understanding the requirements of group of users; (2) increasing the focus on the target users' needs and making them more explicit [15]; (3) narrowing the users being designed for and enhancing the identification with the target user [16,17] and (4) helping in building empathy and allowing designers to empathize with users to better understand behaviors, motivations and expectations [17].

Since personas concentrate on the solid facts about potential users, it would be useful if the needs and emotions of individuals with type-2 diabetes are incorporated among the personas. While this has been empowered and used in

different areas, there is little data on how we should create personas of type-2 diabetic patients. This has resulted in a risk of creating personas that don't address the needs of people with type-2 diabetes or understand the significant behavior and emotion of these patients. Utilization of the already existent information on creating personas could ultimately lead to the gathering of incorrect information or incorrect assumptions about diabetic patients [13].

C. Empathy

Although a human-centered design is surprisingly difficult, understanding user experience is crucial for designing an innovative product. One of the main issues is the lack of knowledge about Human Computer Interaction (HCI), usability experience and the appreciation and understanding of how users think and function [20]. The assumption is that users will approach and solve problems, in ways similar to the designers and developers of interactive solutions [18]. In situations where the success of a product lies in how it is experienced by its users, gaining an empathic understanding of the users is the key factor.

Empathy is often confused with pity, sympathy and compassion which are each reactions to the plight of others. Empathy is by definition the intuitive ability to identify the user's thoughts and feelings; their motivations, emotional and mental models and the ability to pinpoint the priorities, preferences and inner conflicts [19]. Empathy design is essential for smooth movement from logical/factual matters to practical and confidential situations signifying the perception of individuals having sensation, rather than as just experimental participants. This gives two advantages: subjects, establishment of reverent and empathic information and the designer, provision of empathic idea [10].

In utilizing empathic design approach, both the designer and the user are dynamic elements in the process. This approach would help the internal shift within the designer in order for the empathy and deep understanding to develop. It requires the designer to acknowledge and expand their empathic horizon [26-28], boundaries of understanding and knowledge, which can take the designer outside of his and her comfort zone. This empathic technique has been introduced [29] as medium of communication, where empathy was a capability of putting oneself into another's shoes to establish a relationship and experience the feelings, reactions and behavior of others.

Empathy has shown significant impacts in the understanding of type-2 diabetes patients' needs, perception, and emotions [30]. In a study conducted in Italy [32], the health outcomes of more than 20,000 patients with diabetes, who were assigned to three different groups of physicians were analyzed and the physicians who demonstrated the highest degrees of empathy, achieved the best results with their patients; where the patients had statistically significant lower levels of diabetic complications than the groups who physicians had scored lower in empathy. By attempting to recognize and empathize with patients, it improves the odds of successful health outcomes [31].

D. Empathy Map

Empathy Map (EM) is a tool that helps designers to synthesize their observations and draw out unexpected insights. Unlike personas, empathy mapping focuses on uncovering the sensory information and experience of the end-user. It goes beyond demographic characteristics and builds a better understanding of the end users' behaviors and concerns. Personas focus on interests, skills, personality, dreams and environments; whereas empathy maps uncover what the persona sees, thinks/feels, gains, hears and is challenged by [6]. One of the biggest concerns is making sure what we build is a human centric solution and thus the goal of empathy map is to create a degree of empathy for specific user [8]. According to Bratsberg [39], Empathy map is a user-centered approach that enables the designer to focus on understanding the user by looking at the world through his or her eyes. The Empathy Map reveals the reason behind a user's actions, decisions and choices. Therefore, the empathy map helps designing for real user needs. When the stakeholders understand the user, they are able to understand how small changes in design can have a big impact on users [39].

In the early versions of EM, Matthews [7] proposed four different areas that should be achieved when building an empathy map of a user; Sees', 'say and do', 'think and feel' and 'hear'. However, as an improvement to the EM; Bland [7] added two more important areas; 'Pain' and 'Gains' "Figure 1".

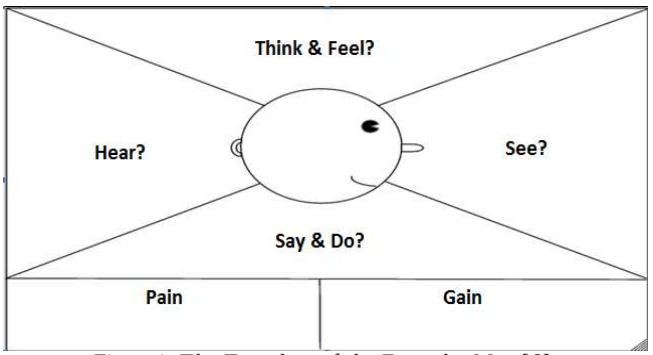

Figure 1: The Template of the Empathy Map [6].

As result, the finalized template consists of six parts of EM as described below:

- **Sees**: Describe what the user sees in the environment.
- **Say and Do**: What the user says and how the user behaves in public.
- **Think and Feel**: What happens in the mind of the user?
- **Hear**: How the environment influences the user.
- **Pain**: What frustrations, obstacles and risks that the user faces.

- **Gain**: What the user really wants and what can be done to achieve the user's goals.

The EM helps in creating profiles of the user/customer's segments beyond the demographic factor, covering environmental and emotional factors and allows for a convenient way to reach out to the users [6]. Although it is a business plan model, EM can be adopted for other purposes such as creating comprehensive personas for chronic illness (e.g. Diabetes) [31].

III. TARGET AUDIENCE

The target audience for this research is type-2 diabetes patients in Malaysia aged >18 since majority of people with type 2 diabetes from middle to low-income countries, such as Malaysia are under 60 years old [25].

IV. METHODOLOGY

The work presented in this paper was developed in the context of the on-going project that involves the design and development of a mobile-based application that facilitates self-management and persuades patients into behavior change and adoption of a healthy-lifestyle. This is a call for attention to key areas where empathy, user profiles and personas can be incorporated. The goal of this application is to persuade patients to adopt healthy habits like self-monitoring of their eating and exercise habits; by invoking emotions; replicating target behavior; providing gratification through incentives and feedback.

UCD methodology, and in particular EM, user profiles and personas as well as behavioral model, are used as a tool to guide the application design and the development.

Traditionally, a user profile contains user requirements and system-relevant characteristics such as: (1) user's technological experience and understanding, (2) cognitive characteristics, (3) tasks, occupation and other requirements. User personas, that follow these standard characteristics may work for a number of technologies, whereas they do not necessary provide sufficient representations to characterize health care consumers. Such characteristics fail to consider the users socio-cultural context, psycho-social factors, behavioral patterns, needs and preference which have a bearing on how users interact with medical devices and information [23]. As a result, in order for mobile health applications to be effective, they must be designed using a sound conceptual framework that is user-centered, culturally sensitive, patient-centric and context-aware.

There are a great number of potential information sources that could be utilized in generating user profiles and personas. This research was built upon two approaches: literature reviews and a qualitative survey. The creation a persona was done in a staged manner. The initial step was to conduct a literature review that provided us with a general understanding of type-2 diabetes; comprehending the factors that cause the minimal success of m-health application and the factors that influence the adoption of m-health in changing a patient's behavior for long and short-term. We felt that we needed to understand the user's behavioral, emotions, needs and other important attributes that could be incorporated in the user profiles and personas, that could have a significant impact during the designing and development. The second step involved using qualitative survey as an instrument to collect the demographic data and experience the emotion, concerns and needs of our selected target audience. Questions asked in the survey are: relating to our users' knowledge about healthy eating, frustrations, understanding of the illness and their conditions, difficulties they face, type of regime and activity level (being active or passive) and how a self-management application could improve the patient's attitudes towards adopting and maintaining healthy eating habits and lifestyle [40]. The questionnaires went through several assessments by dietitians and physicians, in order to simplify, validate our understanding, reduce the redundant questions and ensure that all questions arrived at a consensus viewpoint between the designer and the users. The finalized survey consisted of the following sections:

- **Part 1:** Demographic information. This part was about collecting demographic information about participants.
- **Part 2:** General knowledges and skills. This part involved collecting information about user's eating habits, decision making and food planning. It also asked about their daily food intake and methods used to count their calorie and carbs.
- **Part 3:** Diet, Eating; Problems and Barriers. This part consisted several questions that were meant to gain deeper understanding of patient's frustrations and emotion toward healthy eating and wellbeing.

The entire study was carried out in the period between November 2015 and April 2016. The study sample involved diabetics living in Malaysia. A convenient sample size was used with 13 respondents being involved. We prepared two versions of the survey: online and hardcopy. Data collection took place between November and December 2015. The online version of the survey was created using an easy to use, interactive tool called *Typeform* [44].

We contacted the Diabetics of Malaysia (DM), briefing them about our study. They were interested to participate and willing to distribute our questionnaire to Type-2 diabetic patients who are registered under this organization. Alongside, we shared the online survey with patients and people whom their family members have type-2 diabetes. Only 10 participants completed the online survey and three people answered the hardcopy questionnaire. Our next step involved, extracting the significant information from the online survey and hardcopy questionnaires and analyzing them. During the analysis of the data, we grouped the patients into three different categories, based on Body Mass Index (BMI) [41]. We also conducted personality tests on the patients in order to identify why patients have different approaches when they are

using health applications. We employed Myers-Briggs Type Indicator (MBTI) which is a psychometric method that was proposed by Carl G .June [42]. The Fogg Behavioral Model [43] was used to identify the behavioral elements of each patient type. The next step involved drafting our personas and classifying them.

Step 4 involved carrying out interviews in 3 patients who we randomly selected from the 13 already recruited in order to further validate our findings and also gain more insights about type-2 diabetic patients. The aim of the interview was to learn about the patient's journey, frustrations, motivations, goals, emotions and behaviors. We kept the interviews very short by asking the patients several questions in which we were able us to build a comprehensive EM. We then included the findings into the already drafted personas.

In an attempt to further validate our findings, so that we have a mutual, clear and precise understanding of type-2 diabetic patients, we performed another meeting with a dietician who has experience in working with diabetes patients in Malaysia. The qualified dietician has validated the findings and provided us with additional information where necessary. Having created the personas, there was the need to validate the persona with the patients. Based on the three created personas, persona was sent to three patients who became our primary contact. They agreed with the theme and information set up in the persona design layout.

V. RESULTS

A. Overview

A total of 13 participants were included in the study. Ten patients filled out the online questionnaire and 3 filled out the hardcopy questionnaires. Three participants, who were randomly selected from the already recruited respondents, were later interviewed. Of the participants, 75% were females and 25% were males with majority aged between 25 and 60years. Majority were of Malaysian descent with most of them having type 2 diabetes. According to the findings, Majority of the patients have completed secondary level and their mobile usages is frequent and skills level is intermediate. With regards to Attitude towards Healthcare, respondents' overall result for the internal subscale is greater than powerful others and chance [46]. This indicates that the respondents have a positive attitude towards controlling and managing their health. They are aware that health it is not a matter of chance, it is not controlled by external forces (such as health professionals), but it is primarily internal [46].

The patients differed in their health beliefs, psychographic, behavioristic, and physical heath. Majority of the patients showed lack of knowledge on the impacts of their eating habits and behaviors on their disease. We observed that majority of the participants who engaged in the study were either obese (>30) or overweight BMI (25-29.9). There were very few who had an ideal healthy weight [41]. This led us to conclude that there are three types of diabetes patients to be considered during the design and development of any Consumer Health Technology (CHT) application, as shown in the "Table I". In relation with that, there was a need to understand how and why patients have different approach when they are using software applications [42]. Thus, we conducted a personality trait test on these patients which showed that the patients fell into several personality types characterized by traits such as acceptance, denial and depression among others. The idea behind using MBTI is to find elements that would allow us to outline some personality traits for a quick user modeling. The survey, interview and observation of patients, result were used to identify the personality type out of 16 combinations in MBTI type indicator. Three personality types were discovered for each archetype, as shown in the "Table I".

The next additional significant component to be included in the persona, was to identify the behavioral elements of each patient type. Based on Fogg behavioral model (FBM [43]), three elements simultaneously affect behavior: motivation, ability, and trigger. They must converge at the same moment for a behavior to occur. This model will help us to understand our participants' behavior and where they are in behavioral model diagram, it will allow us to categorize the participants based on their motivation and ability and what kind of trigger to set for each user in order for the behavior change to occur.

TABLE I. ELEMENTS OF PERSONAS

Archetype	**Archetype -Characteristics**		
	Description	***Personality***	***Behavioral***
Autopilot	Is accepting the fact that diabetes is a life-journey and has to keep on living. Yet this type of patient lack of self-management but has motivation on learning and is willing to take control over their condition	***Adequacy, Appreciation Tolerance***	***High Motivation, Hard "Low" Ability***
Director	Is already taking control of their conditions. They have knowledge about what to eat, how to read information labels, monitor their blood sugar, etc. Their goal is to maintain healthy lifestyle.	***Acceptance, Confidence, Gratitude***	***Ideal Motivation & Ability***
Victim	Is living in denial and depression.Feeling of fear, anger and guilt and that his/her life is heading toward death. This type of paitent is lack of proper health-care guidance and require a lot of attention and monitoring, persuasion is an optimal solution.	***Denial, Depression, Disinterest***	***Low Motivation, Easy-"High" Ability***

In this study, the behavioral components of each patient type were grouped based on the three archetype. The behavioral model will help the designers to understand the user's behavior; aid in better designing decisions of the application and the creation of triggers that would change patient's behavior for long and short-term. Fogg [43] explained that in order for the health application to be useful

and efficient at altering user's attitude and behavioral toward healthy change and lifestyle, it's recommended to make any kind of tasks/process/trigger easier while aiming at enhancing the user's willingness and motivation. The personas' information such as description of archetype, personality, characteristics, and behavior status of each patients, have significantly allowed us to easily identify these three elements.

eating decision and one of her daily bad habit is eating sweet-tasting food that are high on carbohydrates, calories and sugar. She wishes that she could avoid taking medicine by any means even if that requires a change in her lifestyle and wellbeing. She is in need of an application that could motivate, educate and persuade her through healthy change, particularly concerning eating habits.

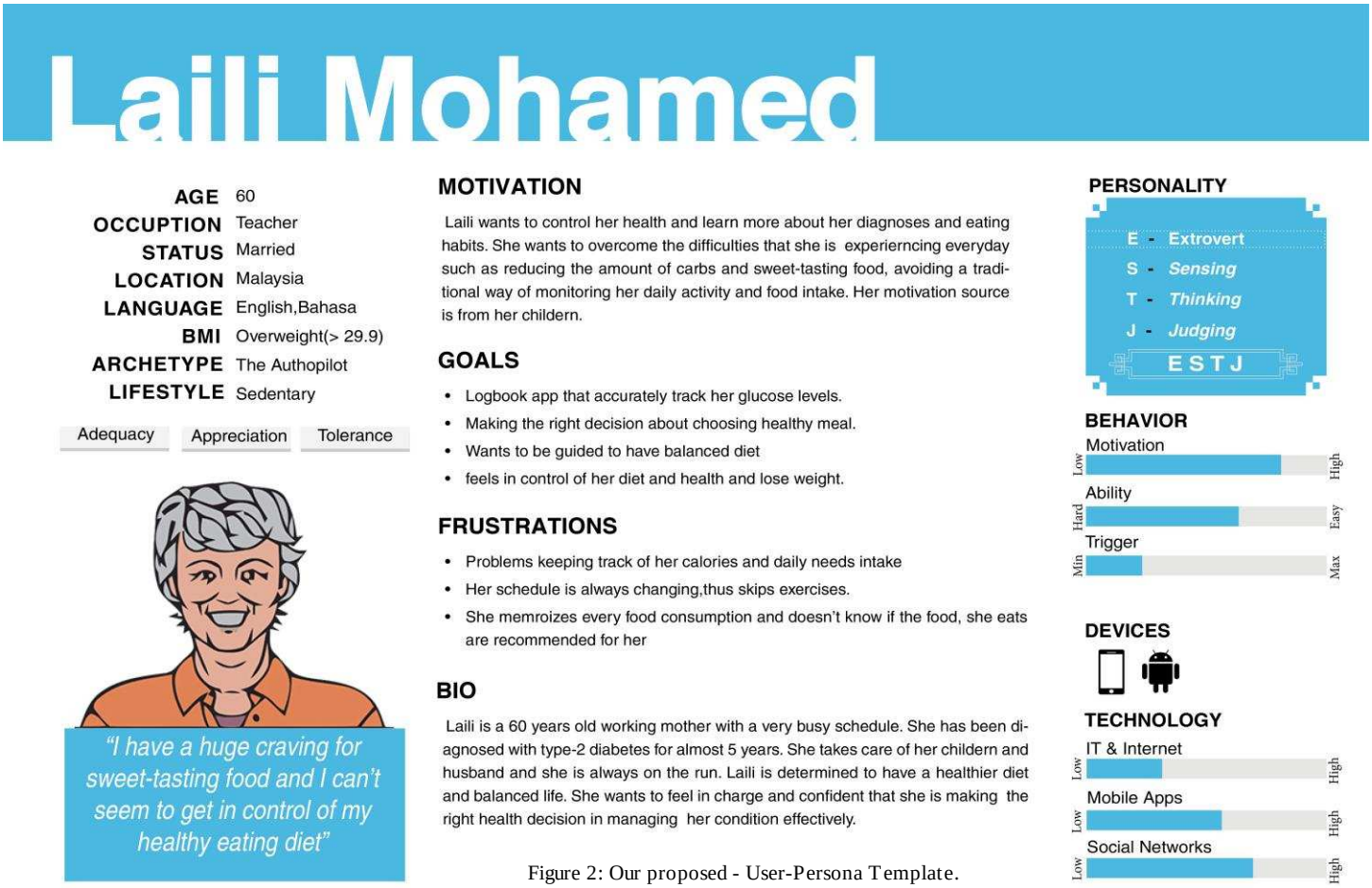

Figure 2: Our proposed - User-Persona Template.

B. *Empathy, Persona Results*

As the result of the above discussion, we incorporated our findings from data analysis, empathy map, user profiles and requirements into our proposed persona template that will be used for the design and the development of high usable mobile application for type-2 diabetes. The template as shown "Figure 2", is designed for user group of overweight BMI (25-29.9), patient with archetype of autopilot as described in the "Table I". This sample illustrated the patient's behavioral level, personality traits as well as the motivation incentive, pain-points. The goals of what we have obtained from the interview which indicates that this type of patient is willing to take control of her health condition but yet the difficulties that she is facing, is the lack of proper management in her busy schedule. Additionally, she finds it hard to make healthy

VI. CONCLUSION

The adoption of empathy approach helps in creating usable, yet comprehensive personas that may arguably enhance design and development performance for type-2 diabetes application in many ways such as: (1) empathy with this particular type of user, (2) designing for ability by simplifying task and creating a dynamic progression. To increase the level of understanding diabetic patients and their context are achieved by expanding and embellishing traditional profile and persona content to include health beliefs, psychographic, behavioristic, and physical health considerations. The resulting user models can be used in future research.

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