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Mobile Computing Technology – Adoption Issues for Inspectors in the AEC industry

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Abstract: This paper presents research on the development and evaluation of a method to aid members in the architectural, engineering and construction (AEC) industry in the effective adoption of mobile computing technology (MCT). A challenge faced within the AEC, with respect to the adoption of MCT, is that common practice lacks a comprehensive and collaborative method for the selection and assessment of potential technologies and focuses primarily on an assessment of potential for operational efficiencies. For this research an adoption method was developed for the assessment and selection of MCT by joining existing selection and assessment processes from the ICT and AEC industries. A case study was conducted with a group of ten electrical inspectors to evaluate the application of the method. Initial results indicated a need for the development of a specific adoption method for the usage scenario. The final results of the case study revealed that the specific adoption method for the usage scenario provided valuable information on the end users' acceptance of the technology and the method was detailed enough in its assessment and evaluation to distinguish between end user acceptance measures for the two devices that were evaluated.

1. Introduction

For this research, mobile computing technology (MCT) refers to portable handheld devices such as a tablet PC or any other type or variation of a computing device that can be used during field activities to perform tasks that would normally be completed using other less technologically advanced data capture techniques like a pen and a pad.

The concept of applying MCT in the field to support electronic data management techniques for the architectural, engineering and construction (AEC) industry is one that is accepted by the industry's practitioners. The industry's geographically dispersed nature makes for a great environment to use MCT for data management activities in the field. The small, lightweight, and portable mobile computing devices are especially applicable to activities in an industry with highly mobile employees (Lee et al. 2007). However, the realization of widespread adoption of mobile technologies within the AEC industry requires further investigation into their applicability within realistic AEC industry usage scenarios (Lumsden et al. 2006).

Research conducted by Lumsden et al. (2006) demonstrated the applicability of mobile data collection facilities within a specific usage scenario for the AEC industry in a way that was applicable to, and usable by, industry members. Their assessment of the technology was comprehensive and included valuable collaboration with the end users, their research did not focus on identifying a straightforward method for the selection and assessment of MCT. The AEC industry needs support for these steps in the mobile computing technology adoption process.

2. Developing the Method

The goal of this research was to develop a comprehensive and collaborative (constant collaboration with the end user) method for selecting and assessing mobile computing technology for AEC industry specific adoption scenarios. This method would need to be simple to follow and straight forward in its application. The research builds on previous work completed in exploring the adoption decision making process in the AEC industry by Rankin and Luther (2006), referred to as the *Rankin/Luther Process*. Their work is enhanced through the *method for selecting features of mobile technology* (Goggin et al. 2007), the *method for designing commercial software applications* (Kaasinen 2005), and the *context-relevant lab-based evaluation of mobile application* (Lumsden et al. 2006).

2.1 Rankin/Luther Process

Rankin and Luther (2006) suggest that the AEC industry adoption process consists of five steps: awareness, interest, evaluation, trial and adoption. They stipulate that awareness and interest are affected by characteristics of technology innovation, diffusion, and industry analyses. They also suggest that the details of the innovation-decision process must be examined to consider the evaluation, trial, and adoption steps. Rankin and Luther (2006) stipulate that the conditions under which a decision is made depends on the knowledge available, previous practice, and perceptions of needs and problems. They also state that any basic decision making process is generalized as defining a problem, searching for a solution, identifying benefits and barriers, and choosing between alternatives. The five steps of the adoption process used by Rankin and Luther (2006) originated from Rogers (1962). Rogers defines the adoption process as “the mental process through which an individual passes from first hearing about an innovation to final adoption.” Rogers identifies the five steps or “main functions” for the adoption process based on his definition. It is important to note that his definition and breakdown of adoption are intended for an individual and not a company or organization. Adoption in the AEC industry should be approached at the company or organizational level, to accurately present their business intentions. The *Rankin/Luther Process* was used as a basis for the development of an MCT method for adoption in the AEC industry.

2.2 Goggin Method

The *method for selecting features of a technology (Goggin Method)* is a method that includes in-depth process analysis, user and management requirement identification and focuses on the context of the use of a technology. Goggin et al. (2007) developed the *Goggin Method* for municipal inspections. Many of their approaches have characteristics that develop upon the *Rankin/Luther Process*. Three steps were used in the *Goggin Method*, 1) classify capabilities of existing technology, 2) identify the perspectives of inspection, and 3) analyze functional requirements – selection of appropriate technology: specific and generic. These steps add depth to the *Rankin/Luther Process*, such as, for example, the *Goggin Method* "analysis of functional requirements" which provides greater insight into the "perceptions of needs and problems" condition of the *Rankin/Luther Process.* This step of the *Goggin Method* also helps to identify the needs of the specific usage scenario that support the business intentions of the adopting company as opposed to the individual, which was the focus of the *Rankin/Luther Process*.

2.3 VTT Method

The human centered design (HCD) process is a method that has been used for the development of software applications in the information and communication technology (ICT) industry. The International Organization for Standardization (ISO) developed the HCD process to overcome poor design of software products (Norman 2005). The ISO 13407-1999 HCD process has been used to improve the design process of software applications. With the support of the Technical Research Center of Finland (VTT), Kaasinen (2005) created a method, referred to as the *VTT Method*, that incorporates the HCD process and software engineering practices for the development of mobile services software for cellular phones. Kaasinen’s familiarity with the ISO 13407-1999 HCD process characteristics (active involvement of users and a clear understanding of user and task requirements, an appropriate allocation of functions between users and technology, the iteration of design solutions, multidisciplinary design) gave her the perspective to interpret the evaluation activities to be used to assess how well the system meets the goals of the user of the organization, to diagnose potential problems and identify needs for improvements, to select the proposed design option that best fits the user and organizational goals, and/or to elicit feedback and further requirements for the users. By emphasizing the needs and abilities of those who were to use the software, usability and ones ability to understand software products, has indeed been improved (Norman 2005). Kaasinen's perspective of the ISO process adds depth to the evaluation and trial steps of the *Rankin/Luther Process*.

Kaasinen's focus was on user acceptance of the mobile service, thus the evaluation stage acted to obtain information on the participants' perceptions of technology acceptance. Kaasinen emphasizes that the acceptance of the mobile services is very important to the design of an easy to use and useful product and the evaluation stages for each of the prototypes provides the needed acceptance feedback during the design.

2.3.1 Technology Acceptance

Designing easy to use and useful products based on user acceptance perceptions has been part of the development of information systems domain since the late 80's. Davis (1989) identified and validated two specific variables that had an impact on user acceptance: perceived usefulness – "the degree to which a person believes that using a particular system would enhance his of her job performance", and perceived ease of use – "the degree to which a person believes that using a particular system would be free of effort." Davis explained that people tend to use or not use an application to the extent they believe it will help them perform their job better (perceived usefulness) and even if potential users believe that a given application is useful, they may, at the same time, believe that the system is too hard to use and that the performance benefits of usage are out-weighed by the effort of using the application (perceived ease of use).

Technology acceptance (usefulness, ease of use) is important for MCT adoption in the AEC industry because it determines user perceptions of the use of the technology. Since the user has to use the technology, the user's perception of the technology will have a direct impact on the use of that technology and consequently a direct impact on the success of the adoption of the MCT. The research completed by Kaasinen (2005) on the importance of technology acceptance is an important contributor to the design of a method for MCT adoption for the AEC industry that understands the impact that technology acceptance can have on MCT adoption.

2.4 Lumsden et al. (2006)

Lumsden et al. (2006) developed the *context-relevant lab-based evaluation of mobile applications (Lumsden et al.).* In a context relevant lab environment, two input modalities for use with a mobile data collection application for concrete test technicians were evaluated. Lumsden et al. (2006) applied usability measurements (efficiency, effectiveness and satisfactions) as part of their evaluation. The purpose of their evaluation was to a) determine and compare the effectiveness and usability of the two different inputs and b) to determine which of the two inputs is preferred by users in relation to the application's intended context of use. Their research focused specifically on the measurements of usability and the importance of the context of use. Their results provide some insight into data entry suitability according to context of use and input technique.

2.4.1 Context of Use and Usability

Context of use and usability are very important aspects in the development of a method for MCT adoption in the AEC industry. To meaningfully assess the suitability of the technologies for a given usage scenario it is, however, essential that the lab set-up adequately reflect the intended context o fuse of the technology (Lumsden et al. 2006). The research into context-relevant evaluations by Lumsden et al. (2006) is an important example of effort put forth to effectively adopt MCT. However, a consistent understanding or definition of these two terms may not be shared throughout the AEC industry. For the purpose of this research the definitions for context of use and usability will be as follows,

> Usability – As defined by ISO 9241-11:1998; the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use. (Userfocus 2007a)
>
> Context – As defined by ISO 13407:1999; the characteristics of the user, tasks, and the environment in which the system is used. (Userfocus 2007b)

For this research an adequate usability evaluation of MCT was not completed. There were limitations to the design of an environment that was to be used for this type of evaluation and consequently an evaluation could not be performed. However, this did not take away from the specific identification of the context of use. The context of use identification was a very important aspect of this research, and the work performed by Lumsden et al. (2006) helped solidify it as a definitive part of a method for MCT adoption in the AEC industry.

2.5 MCT Adoption Method

The *MCT Adoption Method* combines the previous research noted. The resulting method is a set of tasks and deliverables that can be presented to an MCT adopter in the AEC industry. Figure 1 is a representation of this more comprehensive *MCT Adoption Method*.

	Steps	What to do…	How to do it…
1	**Classifying Capabilities of Existing Technology** *(Goggin Method)*	Key attributes: Create a list of the relevant capabilities to be addressed during the selection of appropriate technology	1. Review existing literature 2. Categorize attributes: hardware, software, human-computer aspects, and additional attributes
	Determining Context of Use and User Requirements *(VTT Method)*	Context of use: Determine the characteristics of the user, tasks to be performed, and the environment User requirements: Determine user defined needs	1. Review existing literature 2. Analysis/evaluation of corresponding products 3. Observe user in a given context 4. Interview User
2	**Identifying Perspectives of Inspection** *(Goggin Method)*	Process Steps: Create breakdown of distinct process steps Information Requirements: Detail the type of information captured or accessed (a.k.a. Functional Requirements) Contextual Aspects: Identify several key issues affecting the selection of technology	1. Interview Management and Users 2. Activity Shadow Users 3. Follow-up Questions for Users 4. Develop Templates of Collected information
3	**Selecting Appropriate Technology** *(Goggin Method)*	Selection: Focus the specific requirements based on significant contextual aspects. Address **Key Attributes**	1. Analyze Templates 2. Select Technology
4	**Completing Design Requirements** *(VTT Method)*	Evaluate – Ease of Use, Usefulness: Obtain selected MCT feedback.	1. Create Application Scenario 2. Trial selected MCT 3. Question Participants 4. Use feedback to revise
	Performing Usability Evaluation *(Lumsden et al.)*	Efficiency, Effectiveness, Satisfaction: Obtain selected MCT feedback	1. Create lab enviro. Re: context of use 2. Trial selected MCT 3. Question Participants 4. Use feedback to evaluate

Figure 1 - MCT Adoption Method

There are four steps for the *MCT Adoption Method*. For the first and fourth step there are multiple parts. In total, there are six parts to the *MCT Adoption Method*; classifying capabilities of existing technology, context of use and user requirements, perspectives of inspection, selection of appropriate technology, design requirements and usability measurements. Each part has a breakdown of **what to do** and **how to do it** to aid the adopter in the adoption of MCT in the AEC industry. For the purpose of presentation, all of the steps and tasks from each of the contributing methods have been left in the figure. As a result, there are several redundancies in the *MCT Adoption Method* – for example, the tasks 3, and 4 of the *VTT Method* for step 1 are similar to tasks 2, and 3 of the *Goggin Method* in step 2.

3. Case Study

The New Brunswick Department of Public Safety (NB DPS) provides technical inspection services within the AEC industry. In the summer of 2006, NB DPS began a process to adopt and implement a new database system to manage their services, and in parallel, to adopt and implement MCT for their Technical Inspection Services (TIS) branch. The number of inspections that are required from TIS has been steadily increasing over the last several years. However, the same number of inspectors that were doing the inspections several years ago are attempting to meet the need today. TIS understood the potential of MCT for providing their inspectors with the ability to electronically manage inspection information from the field, and felt that the use of MCT would increase their clients' level of service. Therefore, to reduce risk and meet this demand, TIS made the decision to adopt MCT.

There are over 40 inspectors at TIS. On average each inspector will conduct 1000 inspections in a year. Presently, each inspection conducted is captured in the TIS database. Hence, 40,000 inspections are manually entered into the system from a desktop computer. Therefore, like many participants in the AEC industry, the inspectors at TIS must return to the office to have the information entered into the database, sometimes resulting in an inspector spending half of his/her day entering inspections. The use of MCT to provide the inspectors with the ability to complete data management electronically in the field, ultimately allotting more time for the inspectors to be in the field to increase their levels of client service, is imperative.

The case study for this research is of a specific need for members of NB DPS TIS that conduct technical inspections. The demand for these services is up and as a result, they are reworking their processes by incorporating principles of risk management and supporting these operations in general with MCT. TIS are at the preliminary stages of a MCT adoption and implementation process.

4. Results

There are three sets of results. The first set of results is from the application of the *MCT Adoption Method* to the case study with the TIS inspectors. The second set of results is the application of the refined *MCT Adoption Method*, a.k.a. the *TIS – MCT Adoption Method*. The third set of results is the data collected from the field trial (step 4) of the TIS – MCT Adoption Method application.

4.1 MCT Adoption Method Application Results

Steps 1, 2 of the MCT Adoption Method were applied for the TIS case study. For the results of Step 1, the "classifying of capabilities", a comprehensive directory of the criteria that each device (through the selection of appropriate technology) should meet is determined. The results of step 2, the "perspectives of inspection", were the use of three approaches to obtain information from members of management and inspectors. These approaches were interviews, inspection shadowing and template analysis. From these three approaches it was determined that there was a need to use more approaches to obtain specific usage scenario information to form the perspectives of inspection. Figure 2 is a description of the TIS – MCT Adoption Method.

	Steps	What to do…	How to do it…
1	**Classifying Capabilities of Existing Technology** *(Goggin Method)*	Key attributes: Create a list of the relevant capabilities to be addressed during the selection of appropriate technology	1. Review existing literature 2. Categorize attributes: hardware, software, human-computer aspects, and additional attributes
2	**Identifying Perspectives of Inspection** *(Goggin Method)*	Process Steps: Create breakdown of distinct process steps Information Requirements: Detail the type of information captured or accessed (a.k.a. Functional Requirements) Contextual Aspects: Identify several key issues affecting the selection of technology	1. Interview Management and Users 2. Activity Shadow Users 3. Follow-up Questions for Users 4. Develop Templates of Collected information 5. Create Inspection History 6. Perform Additional Inspector Meetings 7. Identify TIS Specific Context of Use
3	**Selecting Appropriate Technology** *(Goggin Method)*	Selection: Focus the specific requirements based on significant contextual aspects. Address **Key Attributes**	1. Analyze Templates 2. Select Technology
4	**Completing Design Requirements** *(VTT Method)*	Evaluate – Ease of Use, Usefulness: Obtain selected MCT feedback. Create components to assess MCT Create a TIS Specific Field Trial Create a procedure to deploy assessment components	1. Research Evaluation Procedures 2.Create Application Scenario 3. Create User Administered Questionniares 4. Create Approach for Capturing Data as it Occurs 5. Trial selected MCT 6. Question Participants

Figure 2 - TIS - MCT Adoption Method

4.2 TIS – MCT Adoption Method Application Results

The *TIS – MCT Adoption Method* application results were the refinement of Step 2 and Step 4 of the *MCT Adoption Method*. The changes made to the *MCT Adoption Method* are indicated in two sets of results; the first set is of the refinement of Step 2 and the second set if the refinement of Step 4.

4.2.1 Step 2 Development Results

The result was the addition of three information capture techniques, additional inspector meetings, development of an inspection history, and detailed documentation of MCT context of application. There was also a need to refine the "evaluation methods and procedures" from step 4 of the *MCT Adoption Method*. The results of the additional inspector meetings revealed that certain specific contextual information about the inspection process that was not identified through the original meetings.

Additional Inspector Meetings - One such example was the inspectors' explanation that they did not have to meet with the electrical contractor prior to the inspection. Meeting with the electrical contractor before the inspection is a courtesy provided by the inspector. This means that potentially the inspector may not have to conduct the pre-inspection meeting step in the inspection process.

Development of Inspection History – The results of the 2006 electrical inspector inspection analysis indicated that the most common type of inspection is residential. After some discussion with management at TIS, they confirmed that "new residential construction" was also what they considered as the most common occupancy type being inspected and thus the inspectors completed the most data entry for this type of inspection. Contextual aspects such as length of inspection (time spent by the inspector at the point of inspection), average number of daily inspections, and distance traveled for inspections were identified as a result of the addition of this data capture approach. The inspection length, average daily inspections, and distance traveled were contextual aspects of the inspection process that aided in the overall understanding of the application of a MCT for this process. The average inspection length is 30 minutes at the point of inspection. Knowing that the average daily inspections (five) and the length of inspection is 30 minutes, meant that the inspector could potentially be using/carrying/holding the device as a mobile inspector for approximately 150 minutes a day. This duration of time could mean that the weight of the device may need to be evaluated.

Detailed Mobile Context – The results of the detailed documentation of mobile computing technology contexts provided a means for identifying the context for which the field trial would be conducted. However, the ability of the inspector to have access to stored information, as well as, the ability to enter data at any location in the field present the opportunity to allow the inspector to not only stay in the field longer, but also to capture data one time only.

The electrical inspection process has several aspects that need to be evaluated to determine end user acceptance of MCT. In this section, four contextual applications will be identified. Of the four identified, the context of the “stationary inspector entry” will be focused on for the research. The field trial was created in consideration of the inspectors using the mobile computing devices as they conducted their inspections. The inspector would carry the device in their hands as they progressed through the field trial environment that was designed to reflect the common existing inspection. There are locations in the environment where they would stop and enter the relevant information. This method is similar to the data capture method used in the existing inspection process, using a pen and a pad of paper.

4.2.2 Step 3 Development Results

Once Step 2 of the TIS – MCT Adoption Method was complete, two devices were chosen based on their meeting the requirements of the user and management (identified in step 1). The two devices chosen were the OQO (version 1) and the Ruggedized ITRONIX GOBOOK Tablet PC (Figure 3). Each device met the key attributes while providing enough a good range of capabilities between the two (e.g., different size, weight, and input options).

Figure 3 – Devices selected for field trail

4.2.3 Step 4 Development Results

The refinement of Step 4 is focused on the perspectives of the acceptance of technology and the context of use. Its development is directly dependant on the information obtained from earlier steps in the *MCT Adoption Method*. Three sections are discussed in the development of the *VTT Method*; 1) the creation of components to assess MCT acceptance, 2) the creation of a field trial that is contextually relevant, and 3) the creation of a procedure to deploy the components.

Creation of components – There were two components used to assess MCT acceptance; user administered questionnaires and capturing data as it occurs. The user administered questionnaire is a method that is commonly used for obtaining feedback from the participants directly after their use of a MCT. Capturing data as it occurs is a method for obtaining observations of the participant's use of the technology as they perform tasks in the given environment. Capturing data as it occurs was a method for the researcher to obtain specific contextual aspects of the participants' actions as they completed the tasks in the field trial. In order to capture the data adequately, the researcher shadowed the participants.

Creation of Contextually Relevant Field Trial – The field trial was designed to meet time restrictions, the number of participants, the geographic locations of the participants, and the maximum amount of MCT use for each participant. Details are provided for the evaluation environment, data entry forms, coordinator activities, and field trial procedure. The field trials took place in three different field locations; Ramada Inn Fredericton, Technical Inspection Services – Moncton Branch, and Technical Inspection Services – Fredericton Branch. To obtain the type of results that would best reflect the participants' perceptions, the real world environment in which the MCT will ultimately be used was simulated. It had to reflect this physical environment, as well as be mindful of the fact that the technology is designed to be employed by users who are mobile within that area. The key environmental factors replicated and represented in the field locations were: 1) exposure to lighting, 2) length of time for using the device, and 3) level of mobility of the user while interacting with the application.

Creation of a Procedure to Deploy - The field trial was created for a 90 minute time frame to adequately fit the elements of the research and to limit the time commitment of the participants; otherwise the field study could have lasted over 2hrs. All the participants in case study participated in the same set of procedures for completing the study. A total of 10 electrical inspectors took part in the field trial. Each inspector went through the trial procedure once. To avoid learning affects and to mitigate confounding results, the sequence was counterbalanced. In an effort to maintain a 20 minute continuous usage time of each device the evaluations remained connected throughout the trial.

4.3 TIS – MCT Adoption Method Field Trial Results

The *TIS – MCT Adoption Method* field trial results were the application of Step 4 of the *TIS – MCT Adoption Method*. The results for the field trail were in the form of participant feedback through user administered questionnaires throughout the field trial. Three questionnaires were used; Preliminary Questionnaire, Device Evaluation Questionnaire, and Concluding Questionnaire. The questionnaires were designed specifically for the field trial based on the data collected from the initial steps of the *MCT Adoption Method*. The user administered questionnaires in this research were created by adapting questions from existing questionnaires.

4.3.1 Preliminary Questionnaire Results

The purpose of this questionnaire was to provide some commonality among the participants. The information obtained in Step 2 "perspectives of inspection" was based on two inspectors; therefore it was important to indicate that there were commonalities (in terms of technology exposure and context of use) among the electrical ten inspectors that took part in the field trial. This would help ensure the results would be consistent across all inspector responses. The results suggested that all of the participants had, little to no experience with MCT prior to the field trial and the participants performed some form of data capture as they conducted their inspections. From these results it was concluded that the two inspectors could be considered representatives of the group of electrical inspectors and thus the design of the field trial would produce results. Also, the results indicate that the context of the "stationary inspector entry" is an appropriate context of use for the mobile device field trial. Since the inspectors have never used MCT before, they would be unaware of its potential for entering data during an inspection.

4.3.2 Device Evaluation Questionnaire Results

The purpose of this questionnaire was to obtain user perceptions of the use of the device directly after the usage. An overall comparison between the two devices for the three parts to the Device Evaluation is as follows.

Comfort - The OQO and Tablet had similar average medians. The OQO had an average median of 0.7, and the Tablet had an average median of 3.1. This result suggests that the OQO was perceived to be more comfortable to the participant in comparison to the Tablet. However, both average median values are low in terms of the 20 point rating scale which may also suggest that both devices were perceived to have a low comfort rating. It could be concluded from these results that, in terms of participant overall comfort while using the devices, the level did not impact participant acceptance.

Fit For Context – The OQO and Tablet have very similar average medians, meaning that "on average" 50% of participant responses was approximately 8 or greater for both devices on the 11 point rating scale. The overall comparison would suggest that both devices had approximately the same participant perception of their Fit for Context (in terms of the questions used). From these results it can be concluded that, in terms of overall ease of use of the devices, the participants did not perceive either of the devices to be difficult to use and thus this aspect did not have impact on participant acceptance.

Workload – Overall, the OQO and Tablet had similar average medians. The OQO had an average median of 2.8, and the Tablet had an average median of 3.3. This result suggests that the OQO was perceived to have a greater workload in comparison to the Tablet. However, both average median values are low in terms of the 20 point rating scale which may also suggest that both devices were perceived to be low overall. From these results it can be concluded that, in terms of the participant's overall perception of workload, both devices did not negatively impact participant acceptance.

4.3.3 Concluding questionnaire

The purpose of the Concluding questionnaire was to obtain participant perception of device usage and intent to use for the improvement of the inspection process. From the perspective of the management and the inspector, improvement to the inspection process is gained by reducing risk, and by providing a greater level of service to their clients.

Acceptance – The results of the Acceptance section suggest: 1) the majority of the participants believed that the use of the mobile computing device will improve their performance, 2) the majority of the participants believed that the mobile computing device will enhance their effectiveness as an inspector, and 3) the majority believed that the mobile computing device will be useful for inspections. These results demonstrate that the inspectors understood how the device would function to allow them to increase their level of service, thus improving the inspection process.

Fit for Context – The results of the Fit for Context section suggest: 1) the majority of the participants would use MCT to complete data entry in the field, and 2) the majority of the participants would learn to use MCT if it allowed them to do their job better and faster. These key results can be interpreted to suggest that the inspectors understood the usefulness of MCT for the electrical inspection process, thus contributing to the improvement of the inspection process.

Preference – The results of the Preference section suggest: 1) keypad and mouse (OQO) was preferred for entering alphanumeric values and dates, and 2) stylus and keypad (Tablet) was preferred for selecting items and entering text.

5. Conclusions

Various sources of literature were obtained from the ICT and AEC industries relating to the adoption of technology, such as, a *decision making process in the AEC industry* (Rankin and Luther 2006), a *method for selecting features of technology* (Goggin et al. 2007), a *method for designing commercial software applications* (Kaasinen 2005) and *context-relevant lab-based evaluation of mobile applications* (Lumsden et al. 2005). The methods were used to develop a method to accommodate the adoption of MCT in the AEC industry.

There are several key advantages to the use of the *MCT adoption Method*. One of the main advantages is the identification of the specific context of use for a given usage scenario. The importance of the context is often overlooked in the traditional - management identifies a MCT that has the potential to improve a process and adopts it - MCT adoption attempts. Understanding the importance of the characteristics of the user, tasks and the environment in which the technology is used is significant for the adoption of technology and it provides the adopter with a greater appreciation for MCT adoption for a specific contextual application. For example, through the case study presented in this research it was identified that there was a need to add three more data collection approaches (more inspector meetings, inspection history, and a detailed mobile context of use) to help shape the context. Another key advantage of the *MCT Adoption Method* that was identified in the Goggin et al. (2007) research and supported in the case study for this research was the identification of the difference between the end users' understanding of the inspection process and managements' perceptions of the inspection process. These are just some of the advantages of the *MCT Adoption Method.* These advantages and others have the potential to greatly improve the adoption of MCT in comparison to less comprehensive methods.

The MCT Adoption Method is expected to provide the AEC industry with a greater opportunity for a successful adoption of MCT. The method is also expected to reduce risk in processes like inspection, where the inspectors' ability to stay in the field and perform more inspections is important to client level of service and operation efficiencies.

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