Improving the Front End of Innovation: The Case of Mobile Commerce Services

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Abstract. This paper builds on an earlier publication [1] where an Interactive Assessment, namely 'The Mobile (M) Concept Assessment Instrument' was proposed to assist with defining and evaluating m-Commerce (mobile) services in the early stages of creation (i.e. the innovative stages). The paper begins by proving a background to the research problem along with a brief overview of the M-Concept Assessment Instrument. This is followed by a description of the instruments implementation within two real-world m-Commerce organizations. This includes a description of the participant's interaction with and use of the instrument. The paper then concludes with the results of the instruments implementation and its overall impact on the process for creating m-Commerce services.

Keywords: Innovation process · Front end of innovation · Mobile commerce services

1 Introduction

This research focuses on the process for creating mobile (m) commerce services. The early stages of innovation also referred to as the 'front end of innovation' (FEI) [23], is critical to the creation of m-Commerce services. This is as choices made at the front end will ultimately determine which m-service 'concept' will be considered for development and consequently commercialization. The FEI poses several challenges for the creation of m-Commerce services. For example, this process is characterized as ambiguous, uncertain and ill-defined, [2–4]. As a result, it is difficult to define or evaluate the m-service 'concept'. A poorly defined 'concept' can lead to a poorly designed 'service' and consequently a poor consumer/user experience. This research concentrates on improving the FEI activities in the context of m-Commerce services.

In particular, the paper details the implementation of an Interactive Assessment instrument, namely: The Mobile (M) Concept Assessment Instrument - to assist with defining and evaluating m-Commerce services [1] - within the innovation process of two m-Commerce organizations. A brief overview of the M-Concept Assessment Instrument [1] is provided along with a detailed description of its implementation within the m-Commerce organizations. This includes the use of the instrument by the participants (i.e. m-Commerce development teams) when defining their m-service concepts.

Using empirical data gathered within these organizations, the paper then demonstrates an improvement to the front end of the organizations innovation process, as a result of the instruments implementation. In particular, the questions outlined in Table 1 and discussed in Sect. 3 are addressed.

Table 1. Case study questions

Case study questions	
I	How has structure and transparency been altered?
II	How has the exchange of key information been altered?
III	How has understanding been altered?

2 Background: Challenges with M-Commerce Innovation and the M-Concept Assessment Instrument

In recent years it has been argued that too many mobile service innovations fail, or do not achieve their creator's expectations, [5–7]. A possible reason for this is due to poor decision making at the early innovation stages. For example, research suggests high failure rates in the new product/service development are due to the deficiencies in effectively and efficiently managing the front end activities in the innovation process, [8–13]. Effectively managing the activities in the FEI can contribute to the overall success of a new product/service, [14, 15]. This is difficult to achieve as:

- The front end is characterized by its ambiguous nature, high uncertainty or by ill-defined processes [2–4]. As a result decisions are typically made on an ad–hoc basis and ignore key information, [16, 17].
- Key information is often ignored, if it is not exchanged effectively, [18]. This is difficult as information regarding service innovation is tacit and hardly formalized [19].
- This tacit and hardly formalized information can impact the decision makers understanding and consequently decision making in the innovation process, [16].

To address these challenges an Interactive Assessment, namely 'The Mobile (M) Concept Assessment Instrument' was introduced in an earlier publication [1]. A screenshot of this instrument is illustrated in Fig. 1. This paper builds on this earlier publication by describing the instruments impact on the process for creating m-Commerce services. Firstly a brief overview of the instrument is summarized in Sect. 2.1.

2.1 The M-Concept Assessment Instrument

The M-Concept Assessment Instrument aims to assist with defining and evaluating mobile services (e.g. m-Commerce services) in the front end of innovation. To do so m-Commerce innovators and development teams must use the instrument as a 'questionnaire tool'. The overall use of the instrument is divided into three parts, Fig. 1.
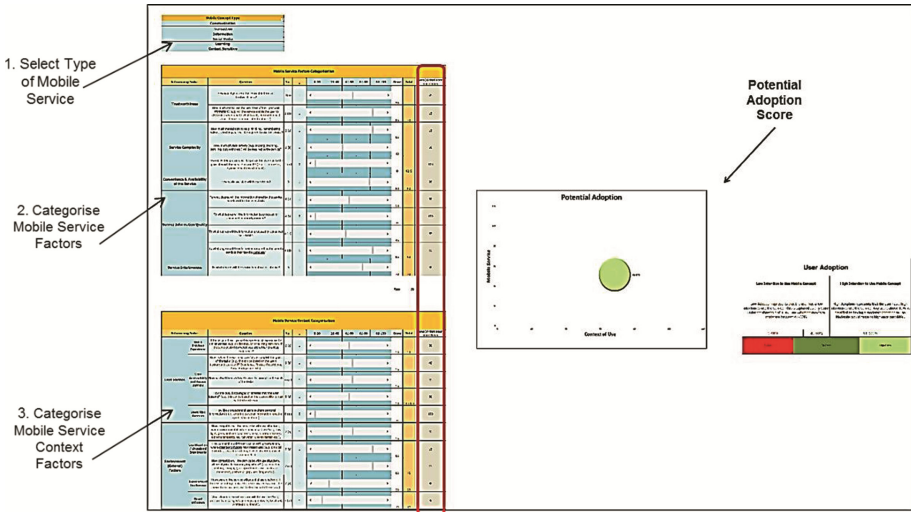
Fig. 1. M-Concept Assessment Instrument for defining and evaluating m-service concepts [1] (Color figure online)

- Firstly, it is necessary to select the particular type of mobile service you are creating from the dropdown list, e.g. transaction service, information service etc. This is illustrated as activity one in Fig. 1. This will filter the aggregated data in the background, so the data field from the relevant data table will be presented in the 3D-Graph.
- The second activity involves defining the particular mobile service characteristics which the mobile concept is likely to comprise of. This includes answering questions in relation to the characteristics of the mobile service and allocating scores to the categories which best describe their concept. For example, the development teams will consider factors such as service complexity and intuitiveness etc. This is illustrated as activity two in Fig. 1.
- The third activity in Fig. 1, defines the particular characteristics of the context within which the mobile concept is likely to be used. This involves answering questions in relation to the context of use and allocating scores to the categories which best describe their concept. Here the development team will consider factors such as the intended use situations etc.

Based on the scores that have been allocated to each of the questions, the mobile service concept is now classified in terms of the assessment instrument. For example, the type of service, its characteristics and the intended context of use, are categorized. The team will now get a 'potential' adoption score, which is represented in a three 3D-Graph. This is illustrated in Fig. 1. This adoption outcome is based on existing mobile service adoption data, which has been classified, aggregated and stored in the background of the assessment instrument [1]. The potential adoption score is divided into three parts; low, moderate and high adoption. Adoption is based on 'intention to use' [20]. Low intention to use is captured as any score under the threshold of 40 %. Any

score above 41 % represents a moderate to high intention to use. Moderate would move to high once past 60 % Fig. 1. These categories were then color-coded for a deeper visual effect. Red indicates low adoption, dark green indicates moderate adoption and bright green indicates high adoption, Fig. 1. The information provided by the 3D Graph, can assist decision makers understating of how these factors will positively or negatively affect the adoption of their service. This visual aid also provides necessary information in a perceptible way, which they can later use to justify their decisions for certain elements of the mobile service.

3   Methodology

In order to assess the impact of the M-Concept Assessment Instrument [1] on the innovation process, a multiple case study approach [21] is applied. This involves implementing the assessment instrument in the innovation process of two real world m-Commerce organizations and assessing the participant's experiences with the instrument when defining and evaluating mobile concepts.

Firstly, case study questions are specified to frame what specifically is to be investigated, these questions are outlined, Table 1. These are formed based on the challenges in the innovation process reported in Sect. 2.

- The first challenge states the innovation process lacks structure and transparency and as a result decisions are made on an ad hoc basis and ignore key information [2–4, 16, 17]. To understand if the instrument addresses this issue, the first question asks: How has structure and transparency been altered? Transparency in terms of this research this is the concept of facilitating any course of action with relevant and necessary information, in an organised and structured way, [17, 24].
- The second challenge suggests key information is often ignored as it is not exchanged effectively [18]. As a result the second question asks: How has the exchange of key information been altered? In terms of this research information exchange refers to the interpersonal exchange of information among the participants, [25].
- Finally, it was recognized that this key information is tacit and hardly formalized which therefore impacts decision makers understanding and consequently their decisions in the innovation process [16, 19]. Therefore the final question asks: How has understanding been altered? Understanding in terms of this research refers to the team member's comprehension of key decision elements, [24, 26–28].

Consequently, these questions highlight the main focus of this paper. These are addressed in Sect. 5 where the data analysis and findings are reported.

Secondly, profiles of the participating organisations are created, these are provided in Table 2. This table includes an overview of the following: the organisation (i.e. sector and size), the organisations innovation process, the participants and the m-Commerce concept to be defined and assessed using the M-Concept Assessment Instrument.

Table 2. Case profiles

Case	Case Study One (CS1)	Case Study Two (CS2)
Organisational Sector	Private	Private
Organisational Size	Small; <50 employees	Small; <50 employees
Innovation Process Activities	Semi-structured, formal but flexible Innovation Process	Semi-structured, formal but flexible Innovation Process
Participants	Project Manager, Design Engineer, Marketing, 2 Software Engineers, Business Analyst	Project Manager, Design Engineer, Service Administration and Support
Mobile Concept	Mobile Payment Transaction Service	Mobile Historic Information Service

Thirdly, the instrument is implemented in the innovation process of these m-Commerce organisations and used by the participants. At this stage data is collected. Firstly, observation data including field notes, template data and print out data is collected by the researcher on-site during the study. These document observations of the participant's interaction with the instrument during the study. Secondly, semi-structured interviews are conducted with each of the participants to capture their experiences with the instrument following its use. Each interview lasts for approximately 30–35 min and is recorded and transcribed.

Lastly, the observation and interview data is analysed following the hybrid inductive/deductive thematic analysis approach [22] in order to answer the case study questions outlined in Table 1. This involves allocating codes to the data (i.e. assigning labels) which are then inspected and connected to identify patterns and themes.

4   Case Studies: Implementation of the M-Concept Assessment Instrument and Data Collection

This section details the case studies conducted with two m-Commerce organisations to investigate the impact of the M-Concept Assessment Instrument on their innovation process.

4.1   Case Study One (CS1) – Mobile Transaction Service

Organisation: The first study is conducted in a private m-Commerce organisation, based in Galway, Ireland. Using the categorisation of company size proposed by the European Commission, the organisation is categorised as a small organisation with less than fifty employees. Six members of their mobile service development team participated in the study. This included a project manager, a design engineer, a business analyst, two software engineers and one member from marketing.

Innovation Process: Their innovation process is categorized as semi-structured. They have formal activities in practice such as formal client meetings, yet the process still

remains flexible. The activities in the process will adjust depending on their clients' needs. For example, some activities may be necessary for one client but not for the next. Taken as a whole, there is no formal definition of the activities which take place within their innovation process.

Mobile Concept: The concept assessed using the M-Concept Assessment Instrument was a 'Mobile Payment Transaction Service'. The aim of this service is to allow one to process small payment transactions in retail/mobile shops (e.g. food at a grocery store or fruit and vegetables at a market stall) on your smartphone, anytime any-where. The end users need to create a profile and purchase online tokens, which they can use as credit for their products. The supplier can approve payment of the products by selecting an option 'approve' when the customer notifies them of the products they wish to purchase.

Instrument Implementation and Use: The study was carried out on-site at the organization. A presentation demonstrating the console of the assessment instrument was given to the participants. After this, the assessment was conducted by the participants, which involved using the M-Concept Assessment Instrument to further define and evaluate their '*Mobile Payment Transaction Service'*. During the study the participants read the instrument questions together as a group exercise. The exercise began with one member suggesting their opinion, this continued until each member in the group had voiced their opinion. The team then debated which score to allocate to each question. This continued until all questions were answered. Based on the scores allocated to each question, the instrument calculated the potential adoption score automatically. The potential adoption score received in this case was 90 %. This means CS1'S '*Mobile Payment Transaction Service'* fitted into the category '*high intention to adopt'*. This indicates that the service is likely to be adopted by its potential customers (users).

Data Collection: The observation and interview data was collected using the techniques outlined in Sect. 3. This resulted in a total of 78 pages of qualitative data which was stored in 'NVivo' a qualitative data analysis software tool. The analysis of this data and the main study findings are reported in Sect. 5.

4.2   Case Study Two (CS2) – Mobile Information Service

Organization: The second study was conducted in a private m-Commerce organization, based in *Dublin*, Ireland. Using the categorization of company size proposed by the European Commission, the organization is categorized as a small organization with less than fifty employees. Three members of their mobile service development team participated in this study. These participants included; a project manager who is also a senior software engineer, a designer who specializes in UX design and a member from service administration and support.

Innovation Process: Similar to CS1, their innovation process is categorized as semi-structured. They have formal activities in practice such as such as, Special Interest Group (SIG) meetings yet the process still remains flexible. The activities in the process will

adjust depending on their clients' needs. For example, some activities may be necessary for one client but not for the next. Taken as a whole, there is no formal definition of the activities which take place within their innovation process.

Mobile Concept: The concept assessed using the M-Concept Assessment Instrument was a *'Historic-Information Mobile Service'*. The service aims to make historical information more accessible to the average person, i.e. in the tourism industry. The service will include a map with 'time capsules' throughout various locations on the map. These time capsules will include information of historical events, which took place at those locations.

Instrument Implementation and Use: Similarly to CS1 the study was carried out on-site at the organization. The participants used the M-Concept Assessment Instrument to further define and evaluate their '*Historic-Information Mobile Service'*. During the study the participants read the instrument questions together as a group exercise. The exercise began with one member suggesting their opinion, this continued until each member in the group had voiced their opinion. The team then debated which score to allocate to each question. This continued until all questions were answered. Based on the scores allocated to each question, the instrument calculated the potential adoption score automatically. The potential adoption score received in this case was 60.43 %. This means CS1'S '*Historic-Information Mobile Service'* fitted into the category '*high intention to adopt'*. This indicates that the service is likely to be adopted by its potential customers (users). Once the assessment was complete, the team reviewed their adoption score. As their score was just slightly above the 60 % they agreed certain factors such as 'use situation' may need to be redefined.

Data Collection: Similarly to CS1 the observation and interview data was collected using the techniques outlined in Sect. 3. This resulted in a total of 60 pages of qualitative data which was also stored in the NVivo database for analysis. The analysis of this data and the main study findings are reported in Sect. 5.

5   Data Analysis and Findings

The data from the two cases was analyzed using the thematic analysis technique described in Sect. 3. References made by the participants to a specific change in the innovation process was recorded, inspected and coded. There were a total of 514 references to a change in the innovation process captured in the data, Table 3. The rigorous analysis of these 514 references resulted in 4 major themes and 22 subordinate themes to explain the data and consequently the impact of the instrument on the innovation process. These themes and the number of references they received from each case are summarized in Table 3. The four major themes are now corresponded with the questions from Table 1 to understand the impact of the m-Concept Assessment Instrument.

Table 3. Themes traced in the data as a result of M-Concept Assessment Instrument

Themes traced as a result of assessment instrument	No. of References	
	CS1	CS2
I. TRANSPARENCY	9	16
Thoroughness	16	9
Structure	20	14
Structure of the Assessment Instrument	10	4
Structure of Activities	17	6
Control	3	0
II. COMMUNICATION	22	11
Quality of Information Exchanged	6	5
Relevant Information	7	10
Consistent Information	0	5
Complete Information	5	3
Information Exchange	17	6
Integrated Exchange	14	8
Engaged Exchange	14	7
III. UNDERSTANDING	16	20
Simplification	15	9
Understanding of the Mobile Concept	23	18
Consistency	6	6
Understanding of Roles	14	5
Guidance	9	10
IV. USER EXPERIENCE	8	6
Value	12	11
Usefulness	6	9
Appropriateness	8	12
Efficiency	7	7
Ease of Use	10	3
TOTAL REFERENCES	**294**	**220**

- **I. TRANSPARENCY:** In relation to the first question in Table 1: *How has structure and transparency been altered?* The data suggests the activities in the innovation process were clearer and conducted in a more thorough manner. In addition, the activities were described as well structured, and therefore easier to manage or control. One participant suggested: "*…using the instrument you can determine whether to move forward to the design stages, or back to the last activity*". This resulted in the activities and roles becoming more 'transparent'. Consequently these changes were recorded under the overarching theme '*Transparency*'. This theme therefore suggests: m-Commerce organizations can clearly and thoroughly define and evaluate mobile concepts in a more structured and controlled manner via the assessment instrument.

- **II. COMMUNICATION:** In relation to the second question in Table 1: *How has the exchange of key information been altered?* The data suggests the exchange of information was more integrated as the opinions of all participants were taken on board. Additionally, the participants were more engaged when exchanging information in the innovation process. Furthermore, the information exchanged, was described as relevant, complete and consistent. This resulted in improved communication during the innovation process. Consequently these changes were recorded under the overarching theme '*Communication*'. This theme therefore suggests: by using the instrument, m-Commerce organizations can exchange relevant and complete information necessary to define and evaluate mobile concepts in a more integrated and engaged manner.
- **III. UNDERSTANDING:** In relation to the third question in Table 1: *How has understanding been altered?* The data suggests it is easier to define the concept as the instrument illustrates the alternative characteristics which describe the mobile concept and its context of use. In addition, the instrument simplified the act of evaluating mobile concepts in the innovation process. For example, based on the categories selected to define the concept a potential adoption score is presented in a 3D-Graph. As a result, the understanding of the key decision elements was improved. Consequently these changes were recorded under the overarching theme '*Understanding*'. This theme therefore suggests the simplification and guidance of the innovation activities by the instrument can enable m-Commerce organizations to comprehend key decision elements in the innovation process.
- **IV. USER EXPERIENCE:** The theme 'User Experience' also emerged from the data, Table 3. This refers to the participant's perceptions and experience with the assessment instrument, [29]. A positive user reaction with the assessment instrument was traced in both cases. For example, the data suggests the assessment instrument is valuable as it can prevent problems arising in the later testing stages. This is as using the instrument can highlight issues prior to development. The instrument also resulted in each participant being more informed and up-to date with the mobile concept, reducing the number of informal discussions. The data also suggests that little effort was required to use the instrument and therefore it is easy to use. For example, one of the participants suggested: "*…the assessment is laid out like a spreadsheet exercise; you simply has to assign scores to the categories*".

The major themes and almost all of the subordinate themes referenced in case study one, have also been referenced in case study two, Table 3. Analytical generalization suggests if two or more cases are shown to support the same outcomes replication can be claimed [21]. Thus, replication is claimed. This is an important conclusion for the creators of m-Commerce services as organizations that fit the profiles of the organizations in this study should expect similar outcomes to emerge following implementation of the M-Concept Assessment Instrument [1].

6   Conclusion

This paper built on an earlier publication [1], where an Interactive Assessment, namely 'The Mobile (M) Concept Assessment Instrument' was proposed to assist with defining and evaluating m-Commerce (mobile) services. In particular, the paper demonstrated an improvement to the process for creating m-Commerce services as a result of implementing the instrument in two real world m-Commerce organizations. Evidence of changes to (i) the structure of the innovation activities were found. This resulted in the activities and roles becoming more *transparent*. In addition, changes to (ii) the exchange of key information was recognized, which resulted in improved *communication* during the innovation process. Finally, evidence that (iii) the innovation activities were 'simplified' was also presented. This resulted in improved *understanding* of key decision elements in the process for creating m-Commerce services. Along with these changes to the innovation process a positive user experience with the assessment instrument was traced across both cases. These findings hold important implications for creators of m-Commerce services, as organizations which fit similar profiles to those within this study should expect similar outcomes to emerge following implementation of the M-Concept Assessment Instrument. Consequently they can also benefit from an improvement to their innovation process. Further case study investigations are currently being undertaken to extend the generalization of the findings.

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