

# The Five Forces of Technology Adoption

Dan McAran<sup>(✉)</sup> and Sharm Manwani

Henley Business School, University of Reading, Reading, UK  
danmca@hotmail.com, sharm.manwani@henley.ac.uk

**Abstract.** The Technology Acceptance Model (TAM), and the models derived from TAM, dominate user acceptance of technology theory. This research uses a web-based questionnaire directed towards legal professionals solicited using the social media site LinkedIn. The research included open-ended questions, within a quantitative survey instrument and received 154 usable responses. In TAM3, Venkatesh and Bala organize the theoretical framework of preceding factors of Perceived Usefulness and Perceived Ease of Use into four categories. The findings reinforced the existence of the Venkatesh and Bala factors that affect technology adoption but reveal additional multi-dimensional factors related to the context of legal technology. It is proposed that analyzing the Five Forces of Technology Adoption: (1) Individual, (2) Social, (3) System, (4) Facilitating Conditions, and (5) Context, could extend our understanding of technology acceptance. In summary, the paper offers a novel interpretation, characterizing five forces of technology adoption - an analogy to Porter's model.

**Keywords:** Technology acceptance · Technology adoption · Context

## 1 Introduction

The increased pervasiveness of computer (and mobile) technology in all spheres of human life is all encompassing. There is concern, most profoundly expressed by several authors in the 2007 special issue of the Journal of the Association of Information Systems entitled *Quo Vadis TAM – Issues and Reflections on Technology Acceptance Research* [1] that despite the extent of the research performed on user acceptance of technology few design specifications or interventions have emerged to enhance or promote user acceptance of technology.

This research is focused on technology used by legal professionals to do legal work (henceforth: ‘legal technology’) and uses a web-based questionnaire directed towards legal professionals asking them to complete the survey instrument based on their personal experiences with a self-selected legal technology product.

Venkatesh and Bala [2] identify four factors as important in understanding a technology adoption situation: (1) Individual Differences, (2) System Characteristics, (3) Social Influence, and (4) Facilitating Conditions. Open-ended questions related to these factors in the survey instrument provide insights on the importance of context in technology adoption. The results of this research reveal additional multi-dimensional factors closely related to the particular context of legal technology that affect technology acceptance, most notably the legal profession practice context.

While the four factors identified by Venkatesh and Bala [2] are, at face value, quite robust, the relative effect of these factors will likely vary based on the nature of the technology and the industry to which it relates. An analogy can be made to the application of Porter's Five Forces [3] to an industry analysis where for one industry a particular factor may be of high importance and in a second distinct industry may be insignificant. This analysis is also supported in the work of Chau and Hu [4]. One objective of this research is to explore how these specific contextual factors can be identified for a given context/technology, in this case legal technology.

Chau and Hu [4] applied the Technology Acceptance by Individual Professionals (TAIP) model to a professional group - physicians - which may have similar technology acceptance characteristics as members of the legal profession. Brown et al. [5] combined a model of collaboration technology and the UTUAT model to develop a model that explains adoption of collaboration technology. In doing so they elaborated the antecedents of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) specific to collaboration technology. Venkatesh et al. [6] extended the Unified Theory of Use and Acceptance of Technology (UTUAT) theory to consumer markets with the creation of UTUAT2 to include constructs for hedonic motivation, price value and habit. In a similar manner the proposed research seeks evidence of the contextual nature of antecedent factors particular to user acceptance of legal technology.

This paper is organized as follows: Sect. 2 is the literature review; Sect. 3, the research methodology; Sect. 4, the results and discussion. Section 5 is the conclusion.

## 2 Literature

Porter [3] postulated five forces which determine the state of competition in an industry. These are: (1) Threat of new entrants, (2) Bargaining power of customers, (3) Bargaining power of suppliers, (4) Threat of substitute products or services, and (5) Intensity of competition.

These Five Forces can be viewed as contextual forces that affect the state of competition in an industry. Porter [3] elaborates that a firm's strategy can be based on the analysis of these forces. This leads to the conjecture that it may be possible to develop a strategy in regards to the acceptance of a technology product by performing an analysis of the contextual forces for a specific technology and context.

A search was conducted to locate literature in which Porter's Five Forces had been used as an analogy or template to characterize a set of 'forces' characterizing another domain: only four relevant papers were identified.

In an outline of a study of the adoption of cloud computing by IT outsourcing services, Fung [7] used a model combining Porter's Five Forces [3] as antecedents to two constructs with general similarity to the PU and PEOU in the Technology Acceptance Model (TAM) of Davis [8]. These corresponding factors are Perceived Benefits of Cloud Computing – corresponding to PU – and Perceived Ease of Adoption of Cloud Computing – corresponding to PEOU. The dependent variable was IT Outsourcing Service Provider's Intention to Adopt Cloud Computing which has correspondence to the Behavioral Intention variable also found in TAM. As the research has yet to be

conducted, Fung [7], in his paper, presented only the literature review, research problem, methodology, and research design.

Rice [9] used an analogy to Porter's Five Forces in regards to risk management. Rice [9] identifies the following 'forces' specific to a model designed to understand risk management: (1) Internal Organization, (2) Industry, (3) Information, (4) Infrastructure, and (5) Influences and uses this framework to assess risk in a military helicopter acquisition project. The Information component is composed of "software availability and functionality, information systems backups, and network security" (p. 379).

In a study of technology adoption in manufacturing firms Kristianto et al. [10] discuss leadership as a technology adoption 'force'. Blandford and Adams [11] analyze 'forces' and barriers to technology adoption in healthcare.

Kroenung and Eckhardt [12] also illustrate the constructs appropriate for a particular technology adoption model depend on context. Notably, in one of the limited number of mixed method research projects in IS, Brown et al. [13] compared seven models of technology adoption in the household and comment.

Our findings suggest that context-specific models do indeed offer richer insights, compared to more general models, which calls into question the conventional wisdom about generalizability being the most critical criterion for theory development; rather, it suggests...a focus on the context can be more fruitful (p. 1942).

In this research, the existing Porter's Five Forces are not used as antecedent constructs in the TAM model, but used as an analogy to describe specific forces that affect technology acceptance. We conclude that research into a professional context analysis of legal technology acceptance is worthwhile from both an academic and a practitioner perspective.

### 3 Research Methodology

The existence of significant prior research combined with the exploratory nature of a different context supports a mixed methods approach to investigating factors affecting technology acceptance. The research used a triangulation design combining a quantitative survey with open-ended questions. Ågerfalk [14] notes the close connection between mixed methods research, critical realism, and the emergent design science research which are significant components of this research.

The research methodology found in user acceptance of technology has been almost exclusively focused on surveys (questionnaires) and case studies [15]. A notable exception to the pattern of quantitative research is Venkatesh and Brown [16] in which adoption of personal computers at home was explored. Venkatesh and Brown [16] found additional insights through the use of qualitative methodology:

...the breakdown into more detailed dimensions was possible due to the use of open-ended questions. In fact, the data coding process helped identify dimensions that had not been accounted for in prior research, providing further support that the use of open-ended items helped to overcome a priori expectations, resulting in a more complete understanding of the phenomena. (p. 83)

This research similarly uses open-ended questions in the survey instrument based on the factors outlined by Venkatesh and Bala [2]: (1) Individual differences, (2) System characteristics, (3) Social influence, and (4) Facilitating conditions. The research respondents were solicited using the social media site LinkedIn [17]. The population solicited was legal professionals (lawyers, paralegals, law clerks, and legal assistants). Posts were made to LinkedIn legal related groups. The LinkedIn message system (InMails) and a legal technology email news service were also used to solicit respondents.

The questionnaire requested respondents to complete the questionnaire based on their perceptions of products they were currently using. The following legal technology products were listed by default: (1) Westlaw, (2) PC Law, (3) LexisNexis – Quicklaw, (4) Fastcase, (5) AccessData – Summation, and (6) Sage – Timeslips. The respondents were also permitted to enter a legal technology product of their own choice.

The following open-ended questions were included in the questionnaire:

1. Are there factors specific to you personally that influence your decision on whether to use or not to use a legal technology product?
2. Are there factors specific to the people you work with or the social situation where you work that influence your decision on whether to use or not to use a legal technology product?
3. Are there factors specific to the information system or other technology you use at work that influence your decision on whether to use or not to use a legal technology product?
4. Are there factors specific to the work environment, technical support available, other help available, or other related factors at work that influence your decision on whether to use or not to use a legal technology product?

This research used a web-based questionnaire directed towards legal professionals solicited using the social media site LinkedIn [17]. The research included open-ended questions, within a quantitative survey instrument. The questionnaire received 154 usable responses.

The analysis of the responses to these questions was facilitated by the assignment of double codes to sections of text. Miles and Huberman [18] state "...multiple coding is actually useful in exploratory studies" (p. 65). As an example, a respondent who self-identified as a small business owner and who indicated the importance of cost related to profitability of the small business was assigned a code of 'Cost' and assigned to the Personal factor because 'Cost' is a personal motivator for a small business owner. This text was also assigned to the separate Cost factor analysis. Using this approach a more holistic array of factors affecting technology acceptance was constructed. As will be discussed, a separate analysis was created to highlight unique contextual subthemes related to legal technology.

## 4 Results and Discussion

### 4.1 Introduction

The results of this research show that contextual factors add significant insight in line with the findings of Chau and Hu [4] over and above the 4 factor model developed by Venkatesh and Bala [2]. The interpretation of the Personal factor was expanded beyond narrow demographic factors to include any sub-theme which emerged that had an aspect that could be characterized as a personal experience. The interpretations of Social, System, and Facilitating Conditions have been similarly expanded.

Most of the textual responses were assigned two codes, and consequently appear in more than one specific analysis. This has resulted in a set of analyses that are inter-related and overlap. This process does allow, however, for the identification of the inter-relationships between themes, such as the inter-relationship between the Usefulness sub-theme of Quality and the Professional Practice sub-theme of Professional Usefulness – there is considerable overlap between these two themes, but not complete overlap. As an example, ‘Simplification of Work’ would be a general aspect of Quality, but not specifically identified with Professional Practice.

### 4.2 Personal Factors

The responses characterized under Personal Factors were classified into the following 9 sub-themes: (1) Personal Experience, (2) Cost as a Personal Factor, (3) Personal Perception/Trust of Legal Tech Supplier, (4) Personal Age, (5) Personal Computer Skills, (6) Personal Preference, (7) Personal Skills, (8) Personal Work Preferences, and (9) Personal Innovativeness.

### 4.3 Social Factors

Social factors were identified as important in the adoption and use of technology to do legal work. There are three summary points identifiable in the Social Factor analysis:

1. The highly contextual nature of social factors in technology adoption. This is particularly evident in the factors mentioned of ‘taught at law school’, and ‘peer acceptance of the technology’. The reference to the use of technology taught in law schools is an interesting reflection of macro contextual social factors which influence technology acceptance. This would have similarity to an ‘industry force’ [3].
2. For some legal professionals, the law firm management (often the senior lawyers) determines if other lawyers or legal staff use legal technology.
3. A significant proportion of the practitioners stated they are not influenced by ‘people/social’ factors in the adoption of legal technology.

#### 4.4 System Factors

There were seven sub-themes identified related to System. Among the responses that were categorized as related to System, there was considerable overlap with other contextually related themes.

1. Ability to collaborate overlaps with Collaboration identified under Social Factors.
2. Fit with Workflow overlaps with Personal Work Practices, identified under the Personal Factors.
3. The System factor sub-themes of Technology Integration and Technical Compatibility form a significant part of the Compatibility Factor analysis.

#### 4.5 Facilitating Conditions

The comments of respondents classified under Facilitating Conditions highlight the evolving nature of the modern law office where complete integration of all applications and technology platforms is emerging as the standard. Many of the responses appearing in the analysis above are also represented in other contextual analyses presented in this paper. The most interesting result was in regards to the comments respondents made in regards to technical support. Consequently, the analysis of technical support is broken out into a separate analysis.

#### 4.6 Contextual Factors

Contextual factors distinct from the four Venkatesh and Bala [2] factors discussed above emerged in the research and are discussed in this section.

**Professional Practice.** The many comments and high focus on aspects of professional usefulness of legal technology correspond to the findings of Chau and Hu [4] in regards to the introduction of telemedicine technology in Hong Kong: “Physicians, as a group, appear to be fairly pragmatic in their technology evaluation and selection by focusing on practical utility rather than on technological novelty” (p. 212). The same statement appears to be true for members of the legal profession as well. There are six areas of particular interest in the results that are categorized as the following Professional Practice sub-themes: (1) Case Specifics, (2) Practice Area Considerations, (3) Professional Utility, (4) Legal Profession Culture, (5) Client Factors, and (6) Professional Standard.

**Quality Factors.** The responses characterized under Quality were classified into the following 14 sub-themes: (1) Degree User Friendly, (2) Uniqueness of Legal Technology, (3) Degree Technology Integrated, (4) Degree of Usefulness, (5) Quality of Design, (6) Degree of Ease of Use/Intuitive, (7) Degree Adaptable, (8) Degree of Technical Quality, (9) Degree of Flexibility, (10) Degree of Data Quality, (11) Degree Familiar, (12) Degree of Compatibility, (13) Availability of Enhancements, and (14) Degree of Trialability.

Again there is significant overlap with the sub-themes of Quality with other analyses. Most notably the sub-themes of Degree Technology Integrated and Degree of

Compatibility are included in the separate Compatibility analysis. Many of the specific items mentioned in the Usefulness and Data Quality sub-themes also appear in the Professional Practice section.

**Cost Factors.** Comments coded as ‘Cost’ frequently were mentioned by respondents. Multiple responses were received in regards to ‘Cost/Benefit’, ‘Price’, and ‘Switching Costs’. The results indicate a broad concern with cost in the adoption of legal technology, with 11 different aspects identified. This highlights the importance of cost as a factor in technology acceptance and use.

**Management Factors.** Comments related to Management also appear under the Facilitating Conditions analysis. Many respondents indicated that use of a particular legal technology was required as part of the job. Most of the respondents who indicated that use of a particular legal technology was mandatory were non-lawyer legal staff, such as paralegals, law clerks, legal assistants. However, a number of lawyers working for other lawyers indicated that use of a particular legal technology was mandated. Several comments indicated internal firm power relationships determined what legal technology could be utilized. Management control of overhead costs and management’s decision making ability on what technology to provide were also mentioned.

**Compatibility Factors.** There were 15 responses coded as ‘Compatibility’. The main focus was on compatibility with cellphones and the cloud; compatibility with Microsoft products; and the ability to integrate and synchronize with other technologies. Data synchronization, data sharing, and database integration were also mentioned. One respondent mentioned integration with iPad and another user mentioned compatibility with technology for the visually impaired. The theme of Compatibility can be seen as a sub-theme of System related considerations, but it is useful to highlight the growing importance of integration with emerging technologies.

**Technical Support.** Technical support had numerous comments from respondents in the research. Consequently, the analysis of the responses made in regards to technical support was performed separately. The responses indicate the high importance the respondents attached to technical support, and moreover, the high standards the respondents require for technical support. This can be seen in the numerous and detailed commentary on technical support requirements identified by the respondents. The comments also indicate a level of frustration with the quality of technical support.

**Training Factors.** The small number of comments in regard to training was quite unexpected: there were only nine comments in the research that explicitly referred to training. One lawyer commented that finding time to train staff was an issue.

#### 4.7 Unique Contextual Subthemes Related to Legal Technology

This analysis does not provide new information, but provides an overall summary of the more interesting subthemes identified using the open-ended questions. The specific factors identified here are the sub-themes identified for both the four factors identified

by Venkatesh and Bala [2] and the contextual themes that emerged. In this research the following factors were identified as salient and specific to the legal technology:

1. Legal Usefulness.
2. Client Focus.
3. Usefulness to the Case-at-Hand.
4. Use by Business Partners.
5. The Availability of In-House Support.
6. The Influence of Professional Legal Culture.
7. The Essential Nature of the Product to Practice.
8. The Importance of Fit with Work Flow.
9. The Integration of the Legal Technology into Practice.
10. Organization Factors.
11. Cost of Substitutes.

Additional analyses could be prepared for other technologies and contexts allowing for an appreciation of similarities or differences to legal technology.

#### 4.8 Discussion

The factors identified by Venkatesh and Bala [2] – (1) Personal, (2) People, (3) Social, and (4) Facilitating Conditions have been maintained but the following additional contextual factors have emerged for legal technology: (1) Professional Practice, (2) Quality, (3) Cost, (4) Management, (5) Compatibility, (6) Technical Support, and (7) Training.

In addition, a separate analysis has been prepared to highlight unique contextual subthemes related to legal technology. This additional contextual analysis could be compared to other similarly prepared contextual analyses for other technologies and contexts; such as technology used by medical, engineering, or academic professions.

Further analysis could also be prepared for differing technologies based on the relative strength of the four factors identified by Venkatesh and Bala [2] (Personal, People, Social, and Facilitating Conditions) using a rating system in regards to importance of each factor. A simple rating system might use the following four classifications: (1) No Importance, (2) Low Importance, (3) Moderate Importance, and (4) High Importance; allowing for further comparative analysis.

The above analysis supports the general results of TAM research over the last 30 years. However, the results indicate the definite limitations of a number of the constructs comprising TAM3 in relation to legal technology. Notably in this research the TAM3 constructs of Computer Playfulness, Perceived Enjoyment, Image, and Result Demonstrability appear to have low or reduced importance to the acceptance of legal technology. The constructs appearing in TAM3 could also be used as the basis for comparative analyses of varying technologies used in specific contexts. Yet another basis of preparing a comparative analysis would be the Shih and Venkatesh [19] determinants of the Use-Diffusion model. The general correspondence of this research to the research of Lewis [20] and Manker [21] supports the validity of this research and the generalizability of this research.



The results support the high importance of context in the adoption of technology in professional practice. Chau and Hu [4] identify three contexts influencing technology adoption: the implementation context, the technological context, and the individual context (p. 216). For Chau and Hu [4] the relevant context was the adoption of telemedicine technology in Hong Kong. In this research the relevant context is the adoption of legal technology by professionals mainly based in North America, but the insights developed by Chau and Hu [4] concerning these contexts remain important.

These observations suggest that to understand technology acceptance for any specific technology, it would be necessary to consider the contextual factors specific to the technology under consideration. It also indicates that the value of simple models of technology acceptance may be of decreasing value because of the increased specialization of IT and the increasing importance of context in their acceptance and use. Novel approaches, new models, and more innovative ways of exploring technology acceptance may be required.

In this research we postulate the existence of Five Forces of Technology Adoption: (1) Personal, (2) Social, (3) System, (4) Facilitating Conditions, and (5) Context: these could potentially be factors determining the different models of technology acceptance that appear in the literature including those already mentioned of Brown et al. [5] for collaboration technology and Venkatesh et al. [6] for consumer markets with UTUAT2.

The results also show the benefit of using mixed methods in technology acceptance research – in this case open-ended questions. The use of such data when creating a technology acceptance model for a specific technology within a particular configuration of the Five Forces of Technology Adoption would provide additional insight to the particular case at hand; facilitating the design of a model.

With this focus on designing a technology acceptance model for a specific technology and context we build the ‘IT Artifact’ [22, p. iii]. We also bring IS academic research closer to design. As Simon [23] notes:

Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. ...Design, so construed, is the core of all professional training... Schools of engineering, as well as schools architecture, business, education, law, and medicine, are all centrally concerned with the process of design (p. 111).

This comment of Simon concerning design supports the increasing interpretation of IS research as a design science [24].

#### 4.9 Limitations, Future Research, Management Implications, and Contribution

There are two general limitations to this research (1) this research is cross-sectional, and (2) this research accessed a segment of the target population who had sufficiently good skills to use internet social media; they may not be representative of the total target population. It would be particularly interesting to explore the differences in factors that influence user acceptance of technology among professions. As an example ‘cost’ and ‘technical support’ were found to be significant factors in this research, it would be of interest to determine if these two factors were also important among law, medicine, engineering, academic, and accounting practitioners.

## 5 Conclusion

This research has identified ‘Context’ as an additional important factor to technology acceptance in addition to the factors identified by Venkatesh and Bala [2]. The four factors identified by Venkatesh and Bala [2] plus Context can be viewed as analogous to Porter’s Five Forces [3]. Using this analogy to understand the factors that affect technology adoption can be seen as corresponding to the understanding the individual forces identified by Porter [3] as a pre-requisite to understanding a specific industry. This research suggests the addition of a fifth force ‘Context’ as key to technology adoption. This research is intended to lead to the development of new approaches to understanding and researching technology adoption. As an illustration, we recommend developing a strategy for a new technology product’s acceptance through an analysis of the individual and interacting forces affecting technology acceptance.

In addition, a significant finding in that cost is a barrier to using legal technology. Further, technical support has been found to be highly important in regards to legal technology. The research introduces the concept of Five Forces of Technology Acceptance. As far as the author is aware this is the first research study related to technology acceptance that has used social media (LinkedIn) to solicit respondents.

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