A Review On TAM-SCT Model Perceptions Towards Telematics Technology Adoption

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Abstract The purpose of this paper is to drawn an analysts review on Technology Acceptance Model (TAM) with Social Cognitive Theory (SCT) in the context of adoption telematics technology. **Design/methodology/approach** – Using ATLAS.ti 9 approach, this paper aims to do a systematics review on literature of seven years 2013 to 2020 on the TAM, SCT and studies involved in telematics. This is to find out the trend's practices for both model theory and telematics. The use on link of auto coding feature in ATLAS.ti 9 in TAM and SCT may reflect the factors influence consumers in encouraging and discouraging the intention to adopt telematics technology. **Findings** – A thematic review of these 30 articles identified 20 initial codes characterizing TAM, SCT and Telematics. This concept has found out two interesting finding. Frist is about attitude which reflect TAM and SCT. Second is about human which reflect SCT and telematics.The analyze result presented the current trends on despite of TAM, SCT and telematics pattern and found in the connection relationship in practices. **Originality/value** – Many advanced technologies transform into the digital environment service using telematics device applications, but the review of adoption intention by consumers remains unknown and rarely reflected. This study will give insights based on dataanalysis to discover the possibility in regard to predict consumer perception reflection.

Keywords –Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), Telematics Technology Adoption, ATLAS.ti 9, Thematic.

1 Introduction

Telematics is a paradigm shift for insurers and consumers alike. Telematics is a new advancetechnology which can give good opportunity to reduce motor claims and accidents costs through precise behavior data system in motor insurance industry. Previously, many studies findout that telematics can bring flexible change in motor insurance premium, increase driver safety awareness and downturn claims costs (Litman, 1997). The modern insurance model oftelematics technology system has attracted attention from many insurance companies and global brought a large number of motor insurances in North America and in Europe are adopting this new technology to price risk. Meanwhile, zooming on Motor Insurance Industry in Malaysia most of motor insurance companies are in the process to implement this new telematics technology system to meet consumer expectation on modern motor tariff market inphases of liberalization (BNM, 2018).

According to Laurie (2011), vehicle in telematics is the technology of sending, receiving and storing information about vehicle using information and communication technology. Telematics is a wireless telecommunication system. Combining between information and communications technology networks within telematics vehicle user led to apps user of raw data being collected from Global Positioning System (GPS). Availability of GPS system represent user on board diagnostics where it is possible to record and map exactly where a vehicle is and how is behaving speed, distance, and style together with other sensor devices to monitor driving (Husnjak, Peraković, Forenbacher & Mumdziev, 2015). There are many such telematics products available in the market. For example, the motion sensor detect people for houses lighting, the black box, dongle, manufacturers' embedded telematics equipment,drone and smartphone application or app

Arisen of telematics devices like smartphone apps can help consumers to manage better life quality. Consumers nowadays are demanding for higher levels of trust and transparency in insurance motor services. The growth of innovation imperatives the current life living culture and travel behavior, including internal and external environment factors. Consumers' life hasbeen transformed by the successive waves of digital technologies, internet simplified accessibility usage through apps like smartphones application in motor insurance telematics can bring flexible change in for both consumers and organizations. The existence of new culture will be started replacing the traditional methods of interaction. Consumers prefer to have online interaction by engaging and sharing their experiences usinguser-centric platforms made available such as the online mobile digital platform to explore their personal needs.

By integrating TAM and SCT with under different situation lenses to the understanding of consumers' adoption behavior. With the adoption predictor offering wider applicability in the novel knowledge relating in change characteristics. The technology acceptance model (TAM) with social cognitive theory (SCT) is that some of the

constructs in the adoption predictors are assumed to apply telematics technology which has introduced devices that can connected to the internet access through mobile apps needed in daily to perform various functions integrated with recode data and safety tips on consumers good driving behavior.

Despite from TAM and SCT popularity, the methodology approach of this paper aims to do a systematics review on literature of seven years 2013 to 2020 on the Technology Acceptance Model (TAM) and Social Cognitive Theory (SCT) trends practices to motivated the designing of telematics adoption and to discuss both model/theory based on the following question:

RQ1:What are the underpinning trends practices on TAM-SCT use for both model and theory in design telematics adoption publications in the literature from 2013- 2020?

RQ2:What are the current related relationship found in the practices on TAM, SCT andtelematics in the publications from 2013- 2020?

2 Classic Human Behavior Theories

Classical human behavior theories have been used to explain online consumer attitude behavior. Theory of Reasoned Action (TRA), and consequently, Theory of Planned Behavior (TBP) are the most commonly used models to determine the impact of beliefs, attitudes, and social factors on online users' intentions (Ajzen, 1988). Ajzen (1988) TBP pointed out, perceived behavioral is strongly control linked to the concept of perceived self-efficacy (Bandura, 1977, 1982). However, Theory of Reasoned Action (TRA), Fishbein & Ajzen (1975) figure 1 define TRA as only applicable to behavior under total volitional control. TRA applies only to behaviors in which no external or internal impediments exist to prevent performance of a behavior. Specified concepts in the social and behavior sciences defines the way to predict and understanding of particular behaviors intentions is from combination with perceived behavioral control, can account for a considerable proportion of variance in behavior (Ajzen, 1991). Grounded in these theories, reviewed that attitudes toward the behavior, subjective norms with respect to the behavior, and perceived control over the behavior are usually found to predict behavioral intentions with a high degree of accuracy in human social behavior. Meanwhile, Ajzen (1988) Theory of Planned Behavior TBP, noted that impediments between intention and behavior are common to all in everyday actions (figure 2).

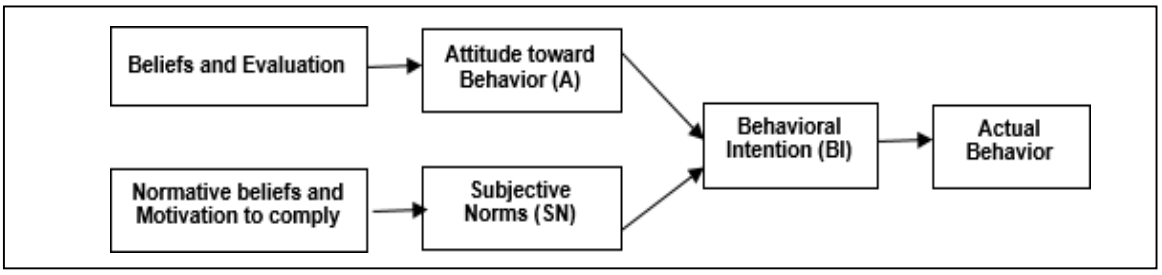


Figure 1 - Theory of Reasoned Action, TRA (Fishbein & Ajzen, 1975)

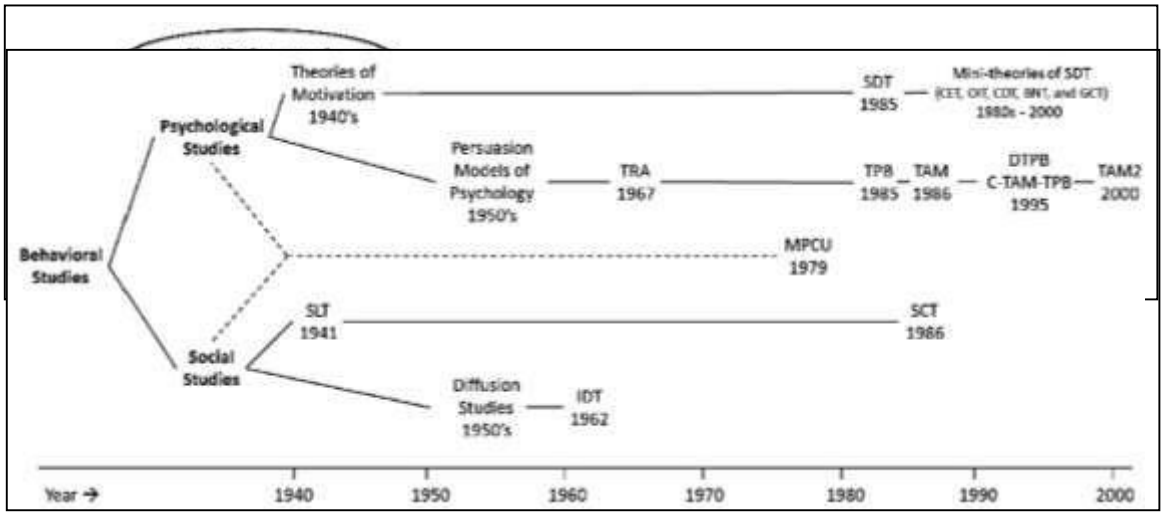


Figure 2 - Theory of Planned Behaviour, TBP (Ajzen, 1988)

Figure 3 - Chronological graph for the evolution of technology acceptance theories (Momani & Jamous, 2017)

According to this review in Figure 3, shown resulted that basic classical human behavioral studies has been branches from the psychological and sociological studies and has formed from four main model and theory on the scientific field which associated along with others research interest, eventually carried out the evolution growth in the new technology acceptance landscape.

2.1 Technology Acceptance Model

Basis of Technology Acceptance Model, TAM was grounded from the Theory of Reasoned Action (TRA) while TRA and TBP (Theory of Planned Behavior) is a General Theory of Human Behavior. Technology Acceptance Model (TAM) has been widely used to predict and explain user adoption of new information technology. The gradual growth of the TAM reflects the influence of the TRA and TPB (Davis, 1989).

Historically, Technology Acceptance Model, TAM was introduced by Fred Davis in 1986 to explain computer usage behavioral. The final version of Technology Acceptance Model was formed by Venkatesh and Davis (1996). Throughout the evolution years, TAM has received extensive empirical support thru validation, applications and replications, for power to predict information system (Davis, 1989; Venkatesh and Davis, 1996). Venkatesh and Davis (2000) proposed the TAM2. After that, Venkatesh and Bala (2008) combined TAM2 (Venkatesh & Davis, 2000) and the model of the determinants of perceived ease of use (Venkatesh, 2000), and developed an integrated model of technology acceptance known as TAM3. Along with original TAM, Venkatesh, Morris, Davis and Davis (2003) studied from the previous theories and formed Unified Theory of Acceptance and Use of Technology, UTAUT.

Models of Innovation Adoption within the literature of TAM, TAM2, TAM3, and UTAUT have been used by various researchers to studied the adoption technology systems and ranging more to the aspect of individual level of acceptance among consumers towards of adoption of new technology.

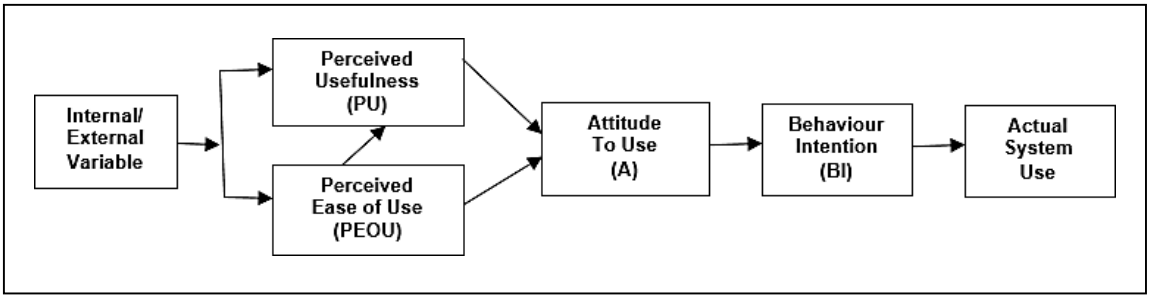


Figure 4 - Technology Acceptance Model, TAM (Venkatesh and Davis, 1996)

In overall viewed, TAM posited two variables categories of such internal variables and external variables. Internal variables consist of factors such as the attitude of the user, their pedagogical beliefs towards, and level of competency. Meanwhile, the external variables review from external barriers faced by user, organizational, technological, and social factors barriers as well.

The primary predictors of TAM is Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance users' job performance and perceived ease of use refers to the extent to which a person believes that using a particular system will be free of effort. Both factors PU and PEOU develop the prediction of users' attitude toward the adoption of new system technology based on positive or negative relationship perception of PU and PEOU.

In theoretically, this two psychological factors PU and PEOU, influenced by the user intention about their concept of beliefs in using the new system technology. Beliefs in PU and PEOU is refer to attitudes as the reason action which leads to behavior intention that motivate users to use new system technology.

2.2 Social Cognitive Theory

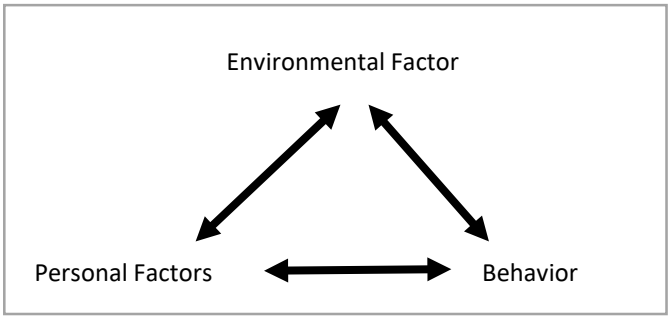


Figure 5 - Social Cognitive Theory, SCT (Albert Bandura, 1986)

Historically, Miller and Dollard (1941) formed a theory of social learning. Albert Bandura studies from previous theory and formed Social Learning Theory (SLT) (1977). Additionally, with closely associated in these theories, Bandura and Walters (1963) wrote Social Learning and Personality Development, broadening the frontiers of social learning theory with the now familiar principles of observational learning and vicarious reinforcement. After that in 1977, with social learning theory Bandura expands another theory of "Self-efficacy: Toward a Unifying Theory of Behavioral Change," provide the concept of self-belief which linked strongly from perceived behavioral of human behavior. Along with SLT, in 1986 Albert Bandura developed Social Cognitive Theory (SCT) and posits that learning occurs in social context with a dynamic and reciprocal interaction of the person, environment, and behavior. SCT has been utilized in many disciplines such as in organizational management

Basically in SCT model, personal factors, environmental influence, and behavior act as interacting determinants that will influence each other bidirectional (Wood & Bandura, 1989). SCT is a useful theoretical framework to understand human behavior needs in a growing technological environment. SCT provides the advanced view of human functioning that accords a central role to cognitive, vicarious, self-regulatory, and self-reflective processes in human adaptation and change.

SCT concepts give an overview of the aspect of the individual behavior model. SCT has a unique feature in emphasizing social influence in terms of external and internal social reinforcement by considering where the individual acquires and maintains the behavior, at the same time SCT also considers the social environment in which the individual performs the behavior with the rapidly changing technology in life.

3 Methodology

Thematic analysis is a method for identifying, analyzing, and interpreting patterns of meaning ('themes') within qualitative data (Clarke & Braun, 2017). Thematic analysis is a process of identifying study pattern and construct themes, using though reading on the subject. Zairul (2020) add term of thematic review using tool ATLASI.ti will give thematic analysis procedure in literature. Here, a review is using ATLASI.ti9 as the tool method of this study applies a qualitative data analysis procedure according to selection paper in a literature review. The selection search of literature was performed according to several selection criteria:

i. Publication from 2013 until 2020
ii. Have a keyword(s) TAM or Technology Acceptance Model and limit-to keyword(s)
iii. Perceived Usefulness, Perceived Ease of Use and Technology Acceptance
iv. Have a keyword(s) SCT or Social Cognitive Theory
v. Have a keyword(s) Telematics
vi. Focusing on consumer intention to use telematics in vehicle

Generally, the literature search was performed in the Scopus and Science Direct. The initial search came out from Scopus with 1,548 for TAM and 182 for SCT underpinning articles. Meanwhile, the initial search came out from Science Direct with 624 on TAM and 192 on SCT articles. The search strings technique from Scopus were extracted using the keyword TITLE- ABS-KEY to find TAM and SCT publication papers according to the year from 2013 until 2020. Added in TAM, the articles search string were extracted using the keyword LIMIT-TO search of PU, PEOU and technology acceptance as additional criteria for TAM literature to enhance the find result. Science Direct database was also used to extract publications papers using keyword "Technology Acceptance

Model" AND "TAM" and "Social Cognitive Theory" AND "SCT" from 2013 until 2020. Results of literature search in this study was generate from research online databases resources as shown in table 1 below.

Scopus	TAM	TITLE-ABS-KEY ("Technology Acceptance Model" AND "TAM") AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Technology Acceptance Model") OR LIMIT-TO (EXACTKEYWORD , "TAM") OR LIMIT-TO (EXACTKEYWORD , "Technology Acceptance Model (TAM)") OR LIMIT-TO (EXACTKEYWORD , "Perceived Usefulness") OR LIMIT-TO (EXACTKEYWORD , "Perceived Ease Of Use") OR LIMIT-TO (EXACTKEYWORD , "Technology Acceptance")) AND (LIMIT- TO (SRCTYPE , "j"))	1,548 results
	SCT	"Social Cognitive Theory" AND "SCT" AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013)) AND (LIMIT-TO (EXACTKEYWORD , "Social Cognitive Theory")) AND (LIMIT-TO (SRCTYPE , "j"))	182 results
	TELEMATICS	TITLE-ABS-KEY ("TELEMATICS") AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013)) AND (LIMIT-TO (SRCTYPE , "j"))	514 results
Science Direct	TAM	"Technology Acceptance Model" AND "TAM" Advance Serach -Year: 2013-2020, Article type:Research articles	2,155 results
	SCT	"Social Cognitive Theory" AND "SCT" Advance Serach -Year: 2013-2020, Article type:Research articles	587 results
	TELEMATICS	"TELEMATICS" Advance Serach -Year: 2013-2020, Article type:Research articles	3,170 results

Table 1 – Search strings from Scopus and Science Direct resources publication 2013-2020 documents.

After performed database result, figure 6 summarizes statistics search results of the underpinning reviewed paper that talks about TAM-SCT according to publication years from 2013 until 2020 for the TAM, SCT and telematics. This answering the research question on "What are the underpinning trends on TAM-SCT use for both model/theory in the publications literature from 2013- 2020?" The analyze result presented the answer on despite of TAM-SCT popularity including telematics.

According to several selection criteria, interpret of both finding model/theory in this publications literature trends has been found utilized in many disciplines or subject area organizational (figure 6) and available in relevant journals platform (figure 7). From figure 7 below, latest result highlighted that the most underpinnings trend of publishing is seen increasing from year to year in TAM, SCT and telematics studies. This article noticed, many publications studies of TAM, SCT and telematics have been regarded as involved to associate and extended on practices using to find result of the subject research.

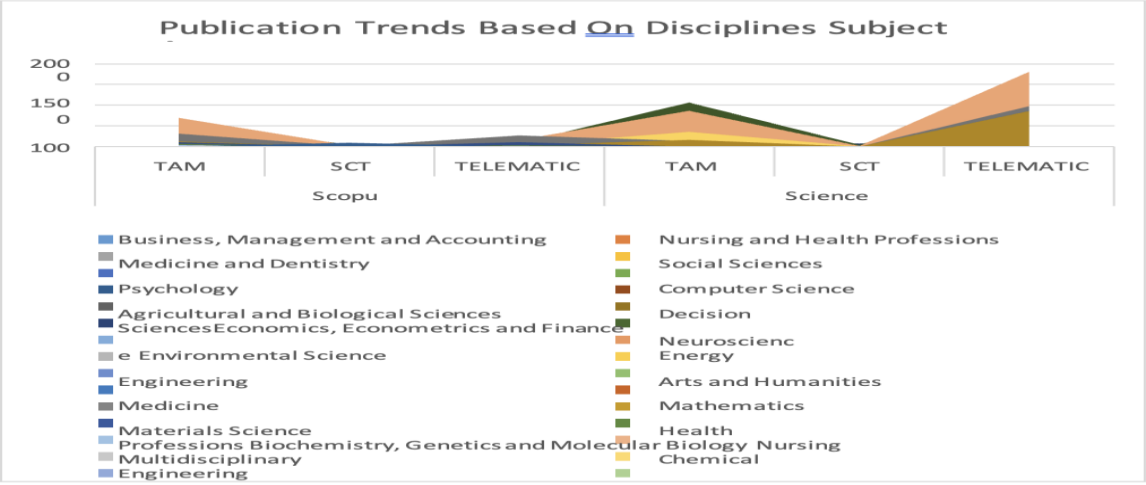


Figure 6- Articles reviewed based on Subject Areas use TAM, SCT and TELEMATICS in stud

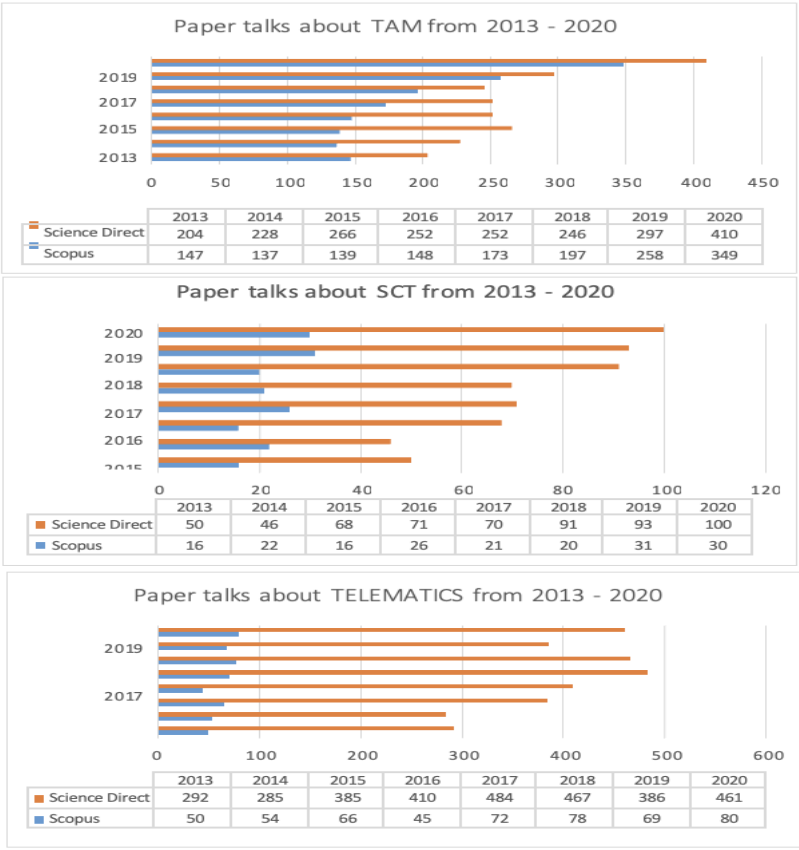
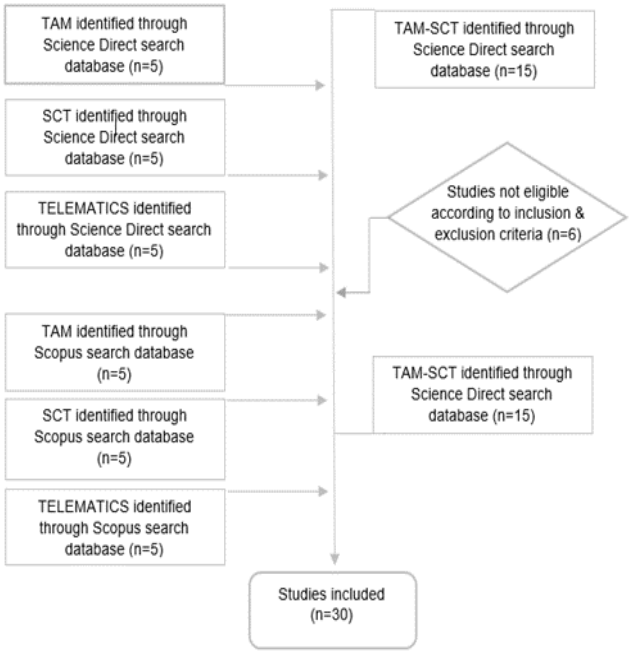


FIgure 7- Search results of studies paper breakdown according to the year of publication in TAM, SCTand Telematics.

3.1 Research Model Design

Figure 8- The thematic review of Inclusion and exclusion criteria



Basically, the literature search was performed in the Science Direct and Scopus search. The initial search came out with 15 (Science Direct) and 15 (Scopus) articles. Breakthrough of 5 articles applies according to the publications literature of TAM, SCT and telematics in the eachScience Direct and Scopus search selection platform. However, 6 articles were removed dueto irrelevant criteria results given is not related in discussing the concept of TAM-SCT model and theory. To the end compared, the total 30 articles was finalized upholoded in ATLAS.ti9 as a primary documents and the code group were established in this study.

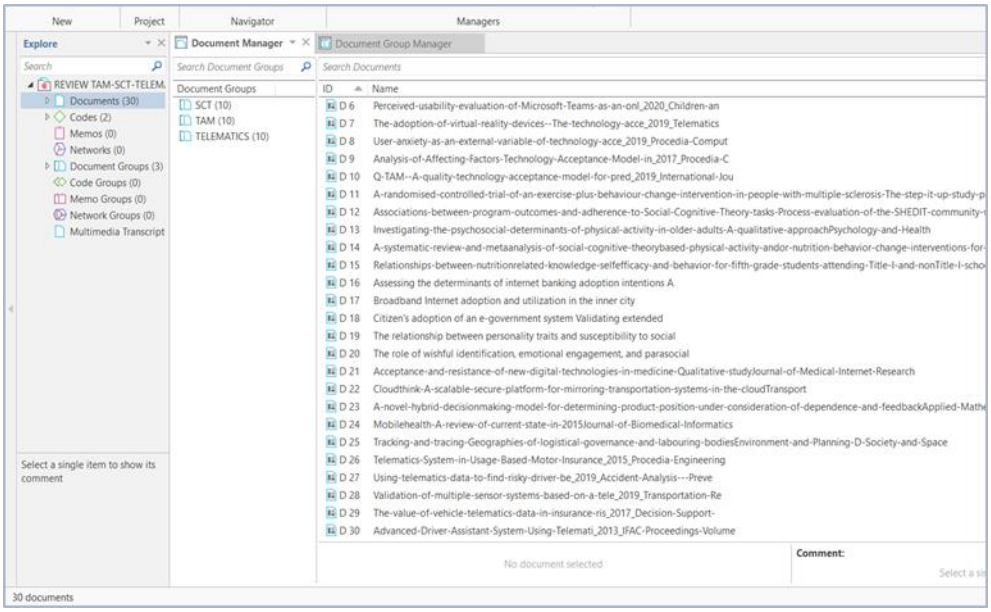


Figure 9 – The primary documents and code group established in ATLAS.ti9

Next, from the 30 primary documents created in ATLAS.ti 9, the classification groupings were initiated automatically established in into 3 code group which is TAM, SCT and telematics for systematic sorting as (figure 9). In regards to this groups coding, 20 initial codes were produced. To answer the research questions on "what are the current related relationship found in the practices on TAM, SCT and telematics in the publications from 2013-2020?", the codes were group into several themes which analyze literature contribution result on the findings

interpretation reviewed.

4 Findings

In this study, the qualitative analysis produced 3 document groups in thematic categories on SCT, TAM and telematics. The thematic category is to review conceptual perceptions towards telematics technology adoption using ATLAS.ti 9 applied approach. Figure 10 show the visualized of word clouds method which presenting the content of frequent word "crunching" lists that have been generated from 30 article in this study. The social word is seen as the larger and bolder displayed word applies and recorded as a popular frequency word among practices in literature content findings image below.

Figure 10- Word cloud generated from 30 articles

After uploaded the selected database, a systematic analysis was undertaken to present data from the synthesis for first document group of 10 SCT articles. Automatically, the networks generate qualitative visualizations linkage on data analysis to identify the current related relationship of Social Cognitive Theory. Figure 11 shows the beginning viewed of the systematic analysis SCT networks. Next, resembles network view in ATLAS.ti9 provides a deep systemic connection of SCT analysis papers that relate to each other. Figure 12 translate the analysis relationship linkage on articles use between SCT to discover concepts. This study analysis have found 8 attractive coding's in form layouts of labeled nodes such as attitude, human, behavior change, environment, motor activity, self-efficacy, lifestyle, quality of life which links to graph in findings factor related show search connection of the basic grounds relationship. Moreover, study review from 8 SCT coding's proposed results of 1470 paragraphs containing code to code linkages that relate to each other research in sentiment analysis ATLAS.ti9. Therefore, reflection finding applies in networks below shows that SCT has proven to be a useful theoretical framework to understand human behavior needs in a mostly growing environment which has been tested recorded by researchers from previous practices.

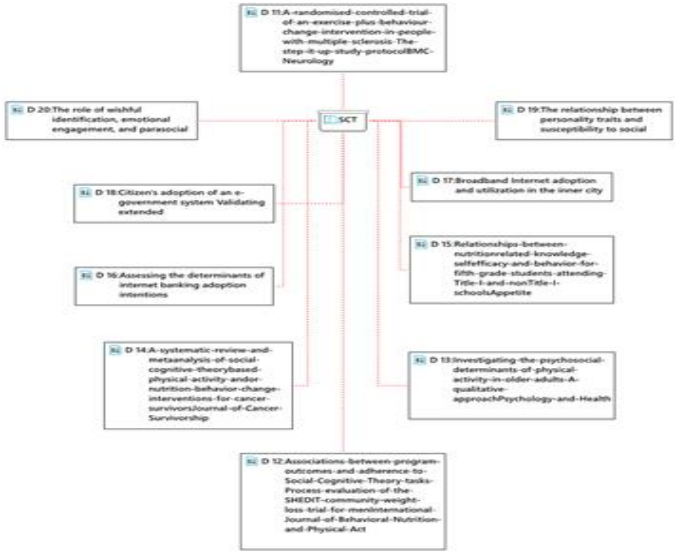


Figure 11: Analysis of SCT data network connection

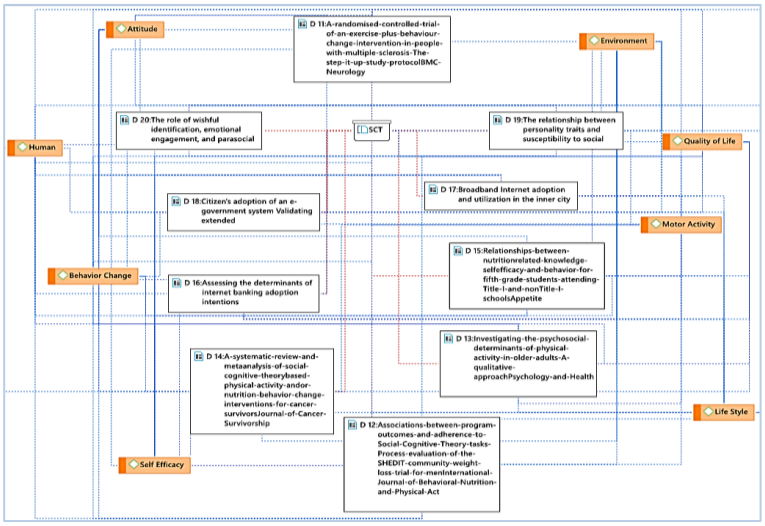


Figure 12: A network view on how to answer research questions through thematic review for SCT

After uploaded the selected database, a systematic analysis was undertaken to present data from the synthesis for the second document group of 10 TAM articles. Automatically, the networks generate qualitative visualizations linkage on data analysis to identify the current related relationship of the Technology Acceptance Model. Figure 13 shows the beginning viewed of the systematic analysis TAM networks. Next, resembles network view in ATLAS.ti 9 provides a deep systemic connection of TAM analysis papers that relate to each other. Figure 14 translate the analysis relationship linkage on articles use between TAM to discover concepts This study analysis have found 5 attractive coding's in form layouts of labeled nodes such as external influence factor related to attitude and human behavior, the perceived usefulness, the perceived ease of use, user technology acceptance which links to graph in findings factor related show search connection of the basic grounds relationship. Moreover, a study review from 5 TAM coding's proposed results of 1446 paragraphs containing code to code linkages that relate to each other research in sentiment analysis ATLAS.ti9. Therefore, reflection finding applies in networks below shows that TAM has proven to be a useful theoretical model in helping to understand and explain use behavior in the information system implementation which has been tested recorded by researchers from previous practices.

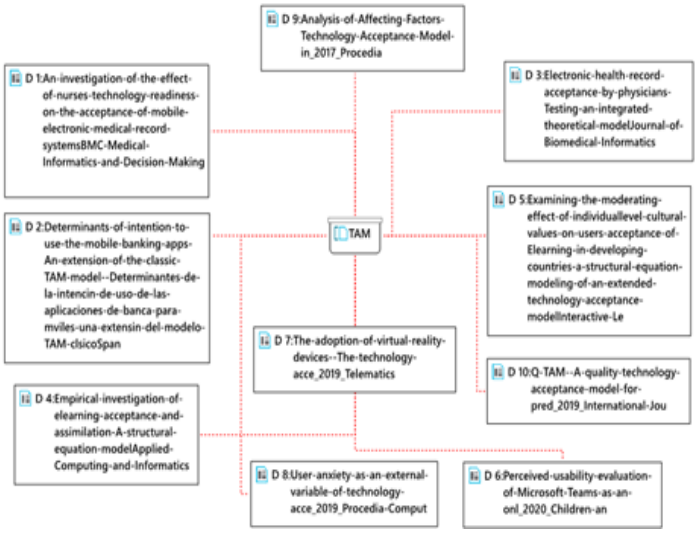


Figure 13: Analysis of TAM data network connection

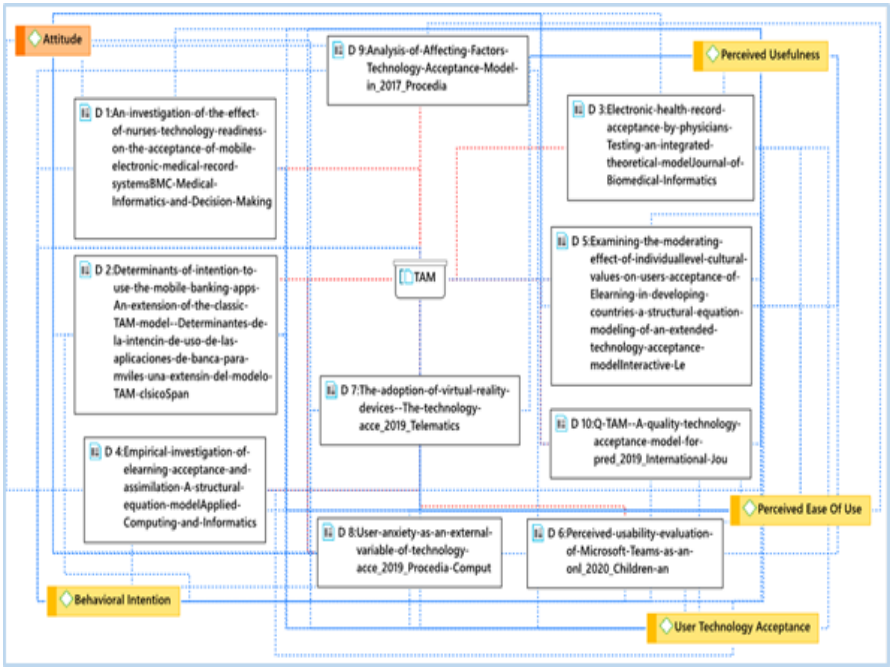
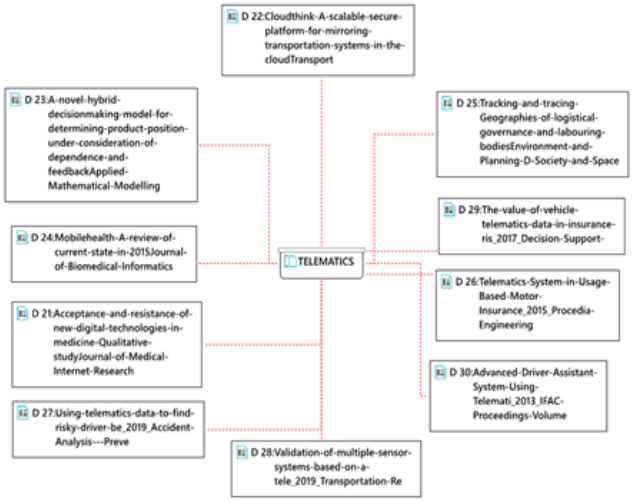


Figure 14: A network view on how to answer research questions through thematic review for TAM

After uploaded selected database, a systematic analysis was undertaken to present data from the synthesis for



second document group of 10 telematics articles. Automatically, the networks generate qualitative visualizations linkage on data analysis to identify the current related relationship of telematics technology. Figure 15 shows the beginning viewed of the systematic analysis telematics networks. Next, resembles network view in ATLAS.ti 9 providea deep systemic connection of telematics analysis papers that relate to each other. Figure 16 translate the analysis relationship linkage on articles use between telematics to discover concepts. This study analysis have found 9 attractive coding's in form layouts of labeled nodessuch as human, digital storage, telematics system, insurance, smartphone, vehicle telematics, intelligent vehicle highway system, global positioning system, information technology which links to graph in findings factor related show search connection of the basic grounds relationship. Moreover, study review from 9 telematics coding's proposed results of 1071 paragraphs containing code to code linkages that relate to each other research in sentiment analysis ATLAS.ti9. Therefore, reflection finding applies in networks below shows that telematics has proven to be a useful use in digital transformation information system which has been tested recorded by researches from previous

Figure 15: Analysis of TAM data network connection

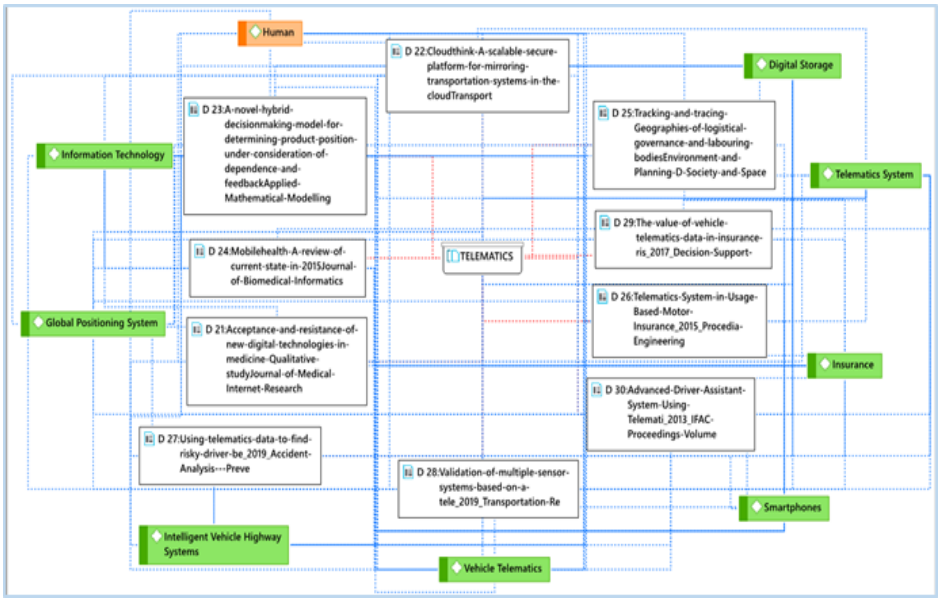


Figure 16: A network view on how to answer research questions through thematic review for TAM

5 Discussion

A wholly review of all semantic networks interpret metaphor result found in fields of SCT, TAM and telematics research application. All networks that serve represent the grounded complex information from selected 30 primary documents upholoded identified 20 initial codes characterizing TAM, SCT and Telematics. Here, ATLAS.ti9 have established attractive graphs networks in form of two-dimensional layouts of labeled nodes and links in findings connection. Synonyms to auto coding feature and implementing to newest ways artificial technology, sentiment analysis in ATLAS.ti9 generate and detect the sentiment reflect it contain all relationship to find out the concept connection of this study. Review coding's proposed by sentiment analysis identify 1470 result containing sentiments findings in SCT. Meanwhile TAM find 1446 and telematics find 1071 results containing sentiments findings related to reflect each other's.

In this study, the conceptual structures have identified that the related relationship in all networks link are more closely resemble by human and attitude. Below is Sankey diagram summarize the result information found in identify overall related finding connection of SCT,TAM and telematics analyses.

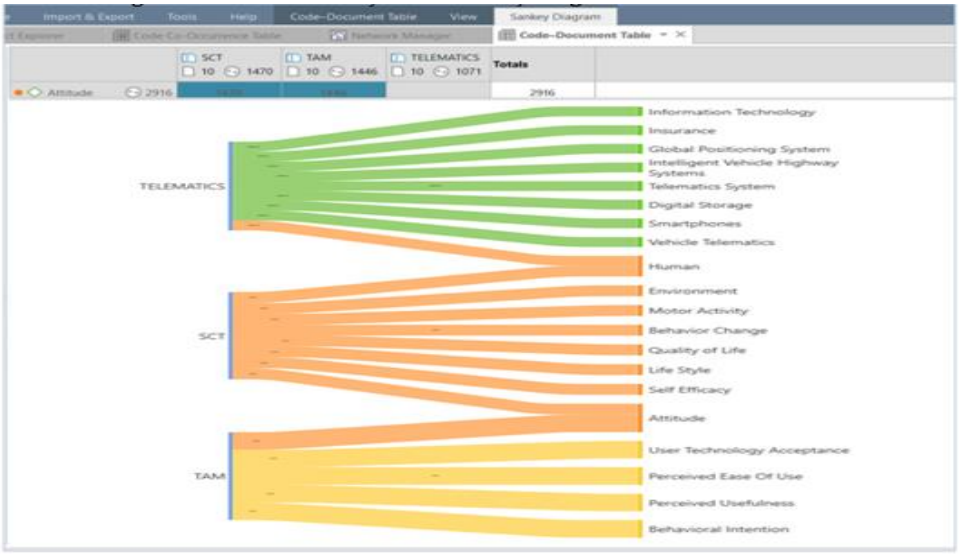


Figure 17: Overall analysis of sankey diagram

Interestingly, metaphor in this study have profound influences on how SCT theory and TAM model conceptualize can act with the respect to adoption in telematics technology. Figure 17above show sankey diagram analyze all result information found in identify 30 factor related in finding connection between SCT, TAM and telematics. In regard, conceptual structuresin sankey diagram have identify in all networks link related in each other relationship. However, in data analysis discovery sankey diagram have come out two main way in designing new perspective among consumer perception reflection. Frist is about attitude which reflect related relationship TAM and SCT. Second is about human which reflect related relationship SCT and telematics. To the end, associate codes in such concepts of this study fill the gaps inidentify the compare prediction and compress data from revise given of previous literature. Moreover, the future research direction can be carried out going with integrating TAM and SCT extension. Second, use the extension both theory and model to assess in designing new the telematics technologies contexts including telematics in mobile service applications, cloud computing applications, drone multifunction medical applications and many more.

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