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Review of PhD Dissertation by Mr Yash Chawla, MSc, Eng.: “Social Media Management for Customer Awareness and Acceptance of Smart Meters” elaborated at the Faculty of Computer Science and Management of Wrocław University of Science and Technology under the supervisor Grzegorz Chodak, PhD, Eng., Prof PWr. and Auxiliary Supervisor Kamila Ludwikowska, PhD

1. Formal basis for drafting the review and criteria for PhD dissertation assessment

The formal basis for drafting this review is the resolution of 17 April 2020 by the Commission for the Academic Degrees in the discipline of Management and Quality Sciences of the Wrocław University of Science and Technology. Pursuant to the resolution I have been appointed to act as a reviewer of the PhD Dissertation by Mr Yash Chawla, MSc Eng.: Social Media Management for Customer Awareness and Acceptance of Smart Meters, elaborated under the direction of prof. Grzegorz Chodak, PhD Eng. in cooperation with the Auxiliary Supervisor Kamila Ludwikowska, PhD. The proceedings is conducted in accordance with the new classification: in the field of social sciences, in the discipline of Management and Quality Sciences.

For the purpose of this assessment, I have received academic accomplishments of the PhD student – a cycle of 7 publications related with the subject mentioned in the title, including analysis, and final conclusions presented in the Summary of Academic Accomplishments (SAA).

The purpose of the review is to assess whether this cycle of publications fulfils conditions laid down in Article 187(1) of the Act of 20 July 2018: The Law on Higher Education and Science (Dz.U. 2018, 1668 as amended), with special emphasis on the criteria of assessment of PhD student’s general theoretical knowledge in the discipline of Management and Quality Sciences and skills in conducting academic research by himself.

The assessment has been based on the compilation prepared by PhD student, which contains the following materials: summary of academic accomplishments (4 chapters of the compilation; 29 pages including bibliography) containing justification for addressing the topic, research

objectives and research subject, description of methodology and research framework (Chapter 1), linkage of the topic with the discipline of Management and Quality Sciences (Chapter 2), summary of results and core papers - Chapter 3). The Summary of Academic Accomplishments includes conclusions (Chapter 4), two appendices; Appendix A: seven publications (copies), Appendix B: co-authorship declarations, bibliography and acknowledgements.

This review has been drafted in accordance with the following:

- Assessment of the selection of the research problem and the scope of research performed,
- Assessment of the structure and the substantive content of the academic accomplishment,
- Assessment of the literature sources use,
- Final conclusion.

2. Assessment of the selection of the research problem and the scope of research performed in the presented publications

For the purpose of the assessment, PhD student submitted the Summary of Academic Accomplishments as well as team accomplishments, i.e. a cycle of publications concerning the subject: Social Media Management for Customer Awareness and Acceptance of Smart Meters. This cycle consists of 7 works developed and published in the period 2018-2020, including 3 papers published in high rated journals classified in JCR with IF >2 (in the list of the Ministry of Science and Higher Education [MSHE] received the score of 140) MDPI: Energy & Fuels and Elseviers, 1 paper in MDPI: Resources, indexed in Scopus base (in the list of the MSHE received the score of 100), 2 papers published in conference materials, international conferences, indexed by WoS (Web of Science), and 1 publication submitted for review awaiting publication in a high rated journal and currently published (publication requirement fulfilled) in the Working Papers in Management Science (WORMS), a repository of the Department of Operations Research and Business Intelligence, Wroclaw University of Science and Technology, Poland.

Detailed description of the publications submitted shows % of authors' contribution:

Item 1, Chawla, Y.(60%), Kowalska –Pyżalska, A. (25%) & Oralhan, B. (15%).(2020). *Attitudes and Opinions of Social Media Users Towards Smart Meter's Rollout in Turkey*. Energies, 13(3) 732, doi:10.3390/en13030732. (140)

Item 2, Chawla, Y.(50%), Kowalska –Pyżalska, A.(35%) & Silveria P.D. (15%). (2020). *Marketing and Communications Channels for Diffusions of Electricity Smart Metres in Portugal*. Elseviers: Telematics and Informatics, 50, doi: 10.1016/j.tele.2020.101385. (140)

Item 3, Chawla, Y. (50%) & Kowalska –Pyżalska, A.(50%) (2019). *Public Awareness and Consumer Acceptance of Smart Meters among Polish Social Media Users*, Energies, 12(14), 2759, doi: 10.3390/en12142759. (140)

Item 4, Chawla, Y.(60%), Kowalska –Pyżalska, A.(25%) & Widayat W. (15%). (2019). *Consumer Willingness and Acceptance of Smart Meters in Indonesia*. Resources, 8(4), 177, doi: 10.3390/resources8040177. (100)



Item 6, Chawla, Y.(60%) & Chodak, G.(40%) (2020). Social Media Marketing for Businesses: Organic Promotions of Web-Links on Facebook. **submitted for review** process in Journal of Business Research. Published in WORKing papers in Management Science.

Item 5, Chodak, G.(35%), Chawla, Y. (35%),Dzidowski, A.(20%) & Ludwikowska, K. (20%). (2019). *The effectiveness of Marketing Communication in Social Media*. Proceedings of the 6th European Conference on Social Media ECSM'19, UK/Ed. By Popma W. & Francis S. Sonning Common: Academic Conferences and publishing International Limited, pp. 73-81. Indexed in WoS Core Collection.

Item 7, Chawla, Y.(80%) & Chodak, G.(20%) (2018). *Recommendation for Social Media Activities to Positively Influence the Economic Factors*. Proceedings of the Conference: Hradec Economic Days 2018, Czech Republic. Ed by Jedlicka P., Maresova P., Soukal I., Hradec Kralove: University Hradec Kralove , 2018, ISSN 2464-6059, vol. 8(1), pp. 328-338. Indexed in WoS Core Collection.

In the Summary of Academic Accomplishments, PhD student presented the topic, research objectives pursued through the publications, and the scope of the research. He motivated the need to address the research topic and identified a research gap in the source literature. The topic concerns management, in a broad meaning, of diffusion of solutions that undoubtedly are innovative, i.e. smart meters (SM) (items 1-4 of the publications) in the era of development of Smart Grids-oriented power industry, using social media. He also attempted to assess the degree of consumers' awareness and acceptance of the new (SM) IT technology solutions.

In particular, PhD student addressed social media management since both internet marketing and marketing communication channels for social media are underused by energy enterprises and business for the purpose of SM promotion. In my opinion this topic is relevant and important in the sub-discipline of innovation and social media marketing, and the research gap, in terms of the lack of research in the field of using social media to assess the level of consumer awareness and SM adaptation has been identified properly.

Nevertheless we may ask why this gap exists. In my opinion the gap mainly results from the ongoing formal, economic, organisational and legal ambiguities with respect to SM and their practical use by energy consumers. Therefore the gap indicates that the degree of interest of energy enterprises and business to promote SM in the current legal, economic and social conditions of specific countries should be researched. Do the enterprises currently wish to promote SM and are they aware of benefits offered through such promotion in social media? What can they realistically offer to the users and what can the users be afraid of?

Unfortunately, the publication cycle contains two clearly different objectives. In next publications (5-7), PhD student focused his academic interest on social media management, on researching activity and increase of Facebook users engagement in digital marketing in particular. He performed two experiments and presented their results in the publications, and attempted (in co-authorship) to research effectiveness of various types of contents in facilitating users engagement in two popular types of marketing campaigns (organic and paid promotions). The last publication (7) includes a range of general recommendations for business users activities, which concern social media and digital marketing.



The topic addressed in these three publications is the subject of broad research by many researchers interested in digital marketing, B2B and B2C, particularly in such fields as content positioning, digital advertising, product placement, copyrighting, easy tracking and social media users interaction patterns. Unfortunately publication 7 dates back to 2018, while the remaining publications to 2019, thus the conclusions and recommendation specified in this publication do not directly result from performed experiments.

In my opinion there is a weak thematic linkage between items 1-4 and 5-7 although in the Summary of Academic Accomplishments, Chapter 3.2, pp. 15-19, the author highlights importance of these publications in the context of the research objectives: therefore publications 1-4 concern the research of the increase of the awareness and acceptance of the specific product, i.e. smart meters, among users of various social media communication channels (Facebook, LinkedIn, TV, Whatsapp, and other), while publications 5-7 concern effectiveness of the campaign and selection of the content for the users of a selected, more popular channel: Facebook - to analyse and measure their engagement; in order to indicate an action plan for energy business and enterprises proposed by PhD student (page 18 of the SAA) aiming to enhance the awareness and acceptance of SM using social media. However the experiments described in items 5-6 concern completely different products (books, computer games, etc.) thus the conclusions formulated by PhD student cannot be specifically refer to such product as smart meters.

All the publications indicate that PhD student's research scope and interest mainly concern social media management, SM diffusion into market and research of social media users' activity in marketing communication channels, on Facebook in particular. Therefore the PhD dissertation topic is consistent with the research scope and topic, however it is less consistent internally, due to the dichotomy I have described above.

3. Assessment of the structure and the substantive content of the compilation and specific academic publications

In the cycle of his publications, PhD student attempts to integrate the key research problems expressed as objectives pursued in the specific publications. The objectives have been specified adequately, although in a rather general manner, and they define direction of the research:

- RO1: to investigate the consumers awareness, preferences, concerns and willingness to accept SM, among social media users.
- RO2: to explore the various sources of information regarding electricity in general and SM in particular.
- RO3: to test the effectiveness of different types of content on social media and device metrics through which managers can interpret the results of the campaigns.
- RO4: to create a social media management plan that would be useful for energy companies to enhance the diffusion of SM.

To accomplish these objectives, PhD student together with a team of researchers conducted an extensive survey in four countries, i.e. Turkey, Portugal, Poland and Indonesia, to assess the degree of acceptance and awareness of consumers, i.e. users of various social media channels, to deliver RO1 and RO2 and assess preferences in terms of communication channels and

marketing information sources focused on SM. The first four papers (items 1-4) concern the survey results.

The next 2 papers (items 5-6) are focused on social media effectiveness and management, and present results of two actual experiments performed and analysed by the team, in terms of effectiveness of marketing activities in a selected communication channel, i.e. Facebook (however they concern activities for different group of clients an unspecified product while SM is not such a product) thus they mainly deliver RO3. The last paper (item 7) is more theoretical and presents recommendations addressed to entrepreneurs and other users, which can be useful to enhance the diffusion of SM as well as of any other product. RO4 is pursued both through paper 7 and the other publications, including recommendations developed for entrepreneurs, and formulated in each paper. The plan to deliver the objectives is presented in the SAA in figure 1.1, p. 6.

The key strengths of the publications submitted as items 1-4 include:

Survey planning and its performance in four countries: Turkey, Portugal, Poland and Indonesia (over 2000 respondents in total). Appropriate preparation of the questionnaire to deliver the survey, in-depth presentation of the structure of variables in the publications, appropriate use of the research tools, methods and tools to analyse the collected data, discussion on the substantive content and critical addressing of limitations for the research. Recommendations for enterprises and defining direction for further work.

Detailed presentation of research methodology in the form of individual parts (sub-chapters) and a very detailed description of the analysis are strengths of the methodological layer of the cycle.

There is an attempt to justify relevance and specificity of the consumer group, including social media users, and assessment of the characteristics to reflect the population for the selected sample (over 500 in each country) based on the comparison of the demographic data gathered under the survey to the data describing social characteristics of social media users in a given country.

Most of the literature review is adequate in terms of the issues covered and includes many publications which justify knowledge of the issues presented in each publication.

I am critical of the following:

PhD student does not justify why he has selected these four countries to perform the survey. They are characterised by different levels of economic and social development and different levels of wealth (GDP level). These countries are not among the leaders of AMI and SM solutions' implementation within their respective territories (compare to Scandinavia or Italy). He has not explained reasons that have contributed to this selection of the survey spatial range.

Publications 1-4 are very similar in terms of the research tool applied, survey questionnaire and analysis of the collected data. None of the publications contains research hypothesis to falsify it. In publications 1- 2, to obtain the results for significant factors effecting the knowledge and awareness regarding SM, binary logistic regression model was used, and additionally in papers 3-4, to obtain the significant factors effecting the willingness to accept SM under various conditions Tobit model was used for each condition. The results were presented on page 12 of

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the SAA, figure 3.2, however the comparison of the diagram content was not subject of a substantive discussion. This finding concerns both research areas: users acceptance and awareness, and preferred sources of information channels, figure 3.3 of the SAA.

The review of literature and theory concerning contemporary changes on the energy market, probably due to the limited space available in the publications, is quite extensive, however non-exhaustive. The author has addressed the key issues, such as aspects of the characteristics of the power sector in a given country, the level of smart grid and SM advancement, and theory concerning acceptance of new technologies (item 1, p. 3), digital marketing (item 2, p. 5); the role of social media in diffusion of innovation (item 3, p. 5). In my opinion, in the work lacks deeper insight in the current aspects of political-economic environment, such as the ongoing controversial legal-economic conditions relating to benefits offered to consumers for their SM use, e.g. situation in Poland. Profitability of SG and SM solutions for consumers is still questionable since grid-related and organisational solutions of the modern energy market still are not ready. Energy market at the level of Industry 4.0 or Internet of Things remain undeveloped. Therefore we may ask whether companies and business want/see benefits offered by mass purchase of SM to deliver campaigns to enhance awareness and willingness to introduce SM among consumers.

These conclusions indicate that the awareness among social media consumers and users is rather low (Turkey – a little more than 49% users know what SM are, in Poland 28%, Portugal 32%, Indonesia 25%- fig. 3.1 p. 11). These results are not surprising since in each of the 4 countries the process of intensive SM roll-out has just started or is to start. The samples in each survey have not been selected in accordance with the sample selection methodology to ensure randomness and relevance of results for the purpose of results generalisation.

The review of the cited literature indicates that PhD student quite often refers to his own publications. Therefore it sometimes raises controversial doubt, particularly when he states that the literature lacks some research, or assesses the level of technological development of other countries, such as Greece, Ireland, or other countries (item 4 p. 2; 3rd paragraph from the top). It could have been confirmed by citing the original sources.

The next 2 publications (items 5-6) concern issues relating to internet marketing/digital marketing. The key strengths of these publications include:

Appropriate planning and performance of the research experiments, including elaboration of metrics to check effectiveness of the different types of content and promotion in the campaign via Facebook.

However the fact that these experiments have not been performed for the campaign delivered for SM is a weakness. It would have provided a certain thematic coherence with power generation and SM implementation, and previously analysed publications (items 1-4). In the SAA, author explained (p. 15) that it would be difficult to obtain permission to perform the experiments in collaboration with entities representing energy companies (although he did not exclude taking this approach in further research).

However, due to the importance of the campaign via FB, which is not only “a content” advertised on FB page during a specific period of time using a specific type of the campaign, it is difficult to generalise results of the experiments performed with other entity. Advertising via

Internet or FB indicates the brand and trust to the entity which promotes and disseminates a given content. It is also to build trust to convince the audience that the published content is not fake news nor manipulation, but it is reliable and credible in the context of law, and reliable due to long-term stability and prospectiveness of the economic environment, etc. Therefore the experiments demonstrate that for a given type of product and content of FB post and for a specific internet store, the video content has a greater reach whereas the image has a greater engagement. Links in the comments were the most effective for organic promotion. These conclusions only concern the studied entity and subject and they cannot be generalised as conclusions recommended for the purpose of SM promotion. But of course is very possible that the same patterns of clients behaviours would have been applied.

In Chapter 3 of the SAA, PhD student also presented his other academic accomplishments and directions planned for further research (Chapter 4 – Conclusion). I always view this type of information as positive as they demonstrate student's research maturity, diversity of interests, and continuity of academic activities.

Due to the weaknesses described above, which however do not affect the value of the work (items 1-4 are particularly valuable), I have the following questions to PhD student:

1. Reduction of energy use in the electrical energy system is not in the interest of companies trading in electricity due to the risk of losing their margin as a result of the reduced volume of energy sold to the buyers. Therefore why should the energy companies be interested in promoting SM-implementation potential via social media and in enhancing awareness of their users? Who should promote SM implementation? Which benefits should be promoted? Do SM offer benefits to all?
2. According to Roger's theory (Roger's model of innovation diffusion) and the value based adaptation model: who should receive SM-related information via social media? What is the desired profile of the recipient of this information? How to explain the fact that the majority of respondents in Turkey are males, singles, well-educated and the unemployed? Will their activity in social media translate into effectiveness of SM implementation?
3. Social media marketing has become an important element of interactive communication in the modern market conditions. To enhance bondage with clients and among clients, and maintain their loyalty, companies apply content management marketing measures, researched by PhD student, and specific social media-based methods of cooperation with consumers to facilitate permanent interaction (community development, blogs, internet webinars, etc.) I would like to hear if energy companies know how to consciously manage social media tools and environment to accomplish their objectives.

4. Assessment of the structure and the substantive content of the academic accomplishment

The first 4 papers (items 1 to 4) were published in journals of a relatively high academic reputation. The works (1-3) were also supported by the National Science Centre NCN Poland's grant no. 2016/23/B/HS4/00650. Item 4 was partially supported by the Faculty of Computer Science in Management, Wroclaw University of Science and Technology. Publication 6 is under

review and has not been yet published in the target journal (Journal of Business Research), while publications 5 and 7 contain conference materials indexed in WoS. Publication 5 was supported by the National Science Centre NCN Poland's grant no. 2018/29/B/HS4/02857. The author has precisely indicated his contributions to each paper drafted in co-authorship (in paper 6 $\geq 50\%$, and in 1 $= 35\%$), and described the scope of work performed in collaboration with the other authors. However the descriptions do not clearly indicate the scope of research performed by PhD student himself.

Only analysis of co-authorship declarations has shown more precisely the author's individual key contributions to development of each publication. In most of the studies presented in the papers, PhD student was co-responsible for elaboration of the survey questionnaire, preparation of the research, analysis of the data and results, literature review, and cooperation with the foreign author. Based on the declarations and PhD student's statement, I am of the opinion that it is difficult to determine precisely his contributions, in theoretical part of the papers in particular. I consider this a systemic weakness of the current doctoral dissertation process delivered based on a cycle of publications.

For this reason it is impossible to assess PhD student's individual contributions on this basis. On the other hand the international nature, broad scope of quantitative studies, and collaboration within the research teams build a very big strength of the research, therefore I rate the degree of the student's individual involvement exclusively based on high percentage of his contributions as sufficient.

The SAA (pp. 4-22) lacks an in-depth comparative analysis of the results (research described in publications 1-4). It would have provided a better insight into the results and the recommendations. The action plan for enterprises concerning the concept of delivery of a campaign to enhance awareness and involvement of social media users is also described rather briefly (covers 1 page) and lacks references to literature, while it adds a major value, resulting from all the research and activities of PhD student in the field of the specific research topic. In the SAA Conclusion (pp. 23-24), the author again indicates the key results and outputs of the research, however he only lists them in a short list.

To conclude my assessment of the cycle of 7 publications in the context of the statutory requirements to demonstrate PhD student's theoretical knowledge in the discipline of Management and Quality Sciences and the skills of conducting research by himself, I am of the opinion that despite the above-mentioned weaknesses, PhD student has demonstrated substantial knowledge of issues related with energy market, changes occurring on this market, social media management, digital marketing and efficiency of FB advertising, and I grade it as satisfactory. As far as his skill to conduct research is concerned, I grade it as good.

5. Assessment of the literature sources use

Quantitative data: The Summary of Academic Accomplishments contains 70 references, item 1. – 65 references; item 2.-64 references; item 3. -75 references; item 4. -48 references; item 5. – 17 references; item 6. -38 references; item 7. -25 references. Over 300 (337) literature sources in total. Citations included in the thesis are drafted correctly in general, and

contain key information to identify the sources. Some citations are repeated, author's own in particular. The literature is in English only and mainly dates back to 2010-2020. Author refers correctly and clearly to each of the items, however, probably due to editing requirements of the journals publishers, the system of describing items differs in each publication. It often does not follow alphabetical order, which makes comparisons of the lists of content difficult. When alphabetical order is followed, references do not start with the surname but with the initial of the first name, which significantly complicates the search for relevant references to compare the papers. References often lack numbering.

6. Conclusion

In my opinion the reviewed cycle of publications constitutes an original solution of the important research problem related with "Social media management for consumer awareness and acceptance of SM". Under the team work, author performed the research: quantitative large-scale survey in four countries, and I consider it of the highest value. He formulated valuable research objectives, and in the specific studies, described in the publications, he defined appropriate detailed research goals, although no research hypothesis was formulated in any of the publication nor has it been falsified. The review of literature and of results of secondary studies, as well as high content-related level of the research confirm that PhD student's general theoretical knowledge in the discipline of Management and Quality Sciences is satisfactory.

The cycle of publications also confirms the author's skill to conduct research activity, including design of research methodology, development of research tools characteristic for social sciences, and collection, analysis and interpretation of the research material. The research performed allowed to deliver the planned research objectives, and obtain interesting cognitive conclusions for the management theory and practice.

In my final conclusion, I consider that the academic accomplishments in the form of the cycle of publications submitted by Mr Y. Chawla, MSc, Eng "Social Media Management for Consumer Awareness and Acceptance of Smart Meters" fulfil requirements of the Act of 20 July 2018: The Law on Higher Education and Science (Dz.U. 2018, 1668 as amended), and request the Commission for the Academic Degrees in the discipline of Management and Quality Sciences of the Wroclaw University of Science and Technology to accept and allow this doctoral dissertation for the public graduation exam.

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