Sudan University of Science & Technology

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A Framework for Social Media Adoption in Business

إطار عمل لتبني الوسائط الاجتماعية في العمل

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Declaration

I am declaring that the thesis titled “A Framework for Social Media Adoption in Business” was achieved by me to get the PhD degree in Computer Science under the supervision of Prof. Fanny Klett, the visitor supervisor in College of Graduate Studies, Sudan University of Science and Technology, Sudan.

The disseminated results based on my reading and understanding of the original texts, and they are not published anywhere in the form of book, paper, article, etc. Other sources that used, such as papers, essays in websites, and books are cited and indicated in references part of this thesis. This thesis was not submitted by me before to any institution for the sake of getting a scientific degree.

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Dedication

To my beloved and very supportive mother Sua’ad, the present, the absent, dad, my supportive brothers Abdulhaleem, Abdulnasir and Obaid, to all who believed in me and covered my back at hard times; I dedicate this work.

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ABSTRACT

Although considerable researches are dealing with the areas of social media analytics, its applications in business, and emerging technologies for big data analytics as isolated areas, there was lack of comprehensive works that considers both social media use in business and providing frameworks or models for such use. Extant frameworks have often overlooks considering suitability of social media for particular business perspectives, performance perspectives, stakeholders, factors that affect adoption process, policies that govern the use and most importantly the existence of the convenient performance measurement system.

The research objectives developing a conceptual framework for adopting social media in the business, so that it assist businesses in identifying needs of stakeholders and/ or contributions expected from them, in addition to properly identifying and tracking targeted performance indicators.

This research is following both qualitative and quantitative methods to survey seven local businesses investigating extant frameworks and studies. Then, the extracted variables from data analysis and literature are used for developing the solution framework, and then validated through two use cases.

Findings shows that social media is likely to succeed in some business areas and get slower success in others, also it shows direct relationship between right identification and announcement of performance indicators from one side and perceiving benefits of social media use. Moreover, it is clear that there is a need for involving actors from related business units in setting up measurements system with clear definition of their responsibilities in adoption process.

Obtained results couldn't be totally generalized for businesses worldwide since the primary data had been collected from businesses in Sudan where ICT infusion and diffusion levels are relatively low. Moreover, the responses had been taken once, which gives a chance for changes in responses over time as a result of changes surrounding factors and business effort to support the adoption of social media. Use cases, too, had been developed to validate certain requirements in the developed framework.

المستخلص

بالرغم من البحوث المقدرة التي تناولت مجالات تحليل الوسائط الاجتماعية وتطبيقاتها في العمل والتقنيات المستحدثة في تحليل البيانات الضخمة كمجالات منفصلة، فإن هنالك شحٌ في الأعمالِ الشاملةِ التي تأخذ بعين الإعتبار كلاً من استخدام الوسائط الإجتماعية في العمل وتقديم أُطُرَ عملٍ أو نماذج لهذا الاستخدام. أُطُرُ العملِ الموجودةِ غالباً ماتغض الطرف عن اعتبار ملائمة الوسائط لمناحي العمل والأداء، وأصحاب المصلحة، والعوامل التي تؤثر على عملية التبني، والسياسات التي تحكم الاستخدام والأكثر أهمية وهو وجود نظام القياس الملائم.

هدف البحث هو تطوير اطار عمل مفاهيمي لتبني للوسائط الاجتماعية في العمل بحيث يساعد الأعمال على تحديد احتياجات أصحاب المصلحة و/ أو الإسهامات المتوقعة منهم، كما يساعد على تعريف ومتابعة مؤشرات الأداء المستهدفة.

اتبع هذا البحث كلاً من الطرق النوعية والكمية لإجراء مسح على سبع مؤسسات محلية وفحص الأطر والدراسات السابقة وبعدها تم استخدام المتغيرات المستخلصة من تحليل البيانات والأدبيات لتطوير اطار العمل والذي تم التحقق من صلاحيته من خلال حالتي استخدام.

تظهر النتائج أن الوسائط الاجتماعية يحتمل نجاحها في بعض مجالات العمل بصورة أسرع من غيرها، كما تظهر وجود علاقة مباشرة بين تحديد مؤشرات الاداء والاعلان عنها من جهة ولمس الفائدة من استخدام الوسائط الاجتماعية. علاوة على ذلك من الواضح أن هناك حاجة لاشراك عاملين من وحدات العمل المعنية في وضع نظام القياس مع التحديد الواضح لمسؤولياتهم.

النتائج التي تم الوصول اليها لايمكن تعميمها بصور كاملة على الأعمال حول العالم لأن البيانات الأساسية تم جمعها من أعمال في السودان حيث ينخفض نسبيا مستوى انتشار استخدام تقنية المعلومات والاتصالات واستخدامها بصورة جيدة. أضف الى ذلك أن الاستجابات تم أخذها مرة واحدة ممايتيح الفرصة لتغيرها مع مرور الوقت كنتيجة للتغير في العوامل المحيطة والجهد الذي يقوم به العمل لدعم تبني الوسائط الإجتماعية. حالات الاستخدام ايضا صممت للتحقق من متطلباتٍ معينةٍ في اطار العمل.

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List of Abbreviations

API	Application Programming Interface
ACCESS	Audience, Concept, Competition, Execution, Social Media, and Sales Viability
BSON	Binary JavaScript Object Notation
DFS	Distributed File System
CRM	Customer Relationship Management
DBMS	Database Management System
DAG	Directed Acyclic Graph
JSON	JavaScript Object Notation
HDFS	Hadoop Distributed File System
ICT	Information and Communication Technology
IT	Information Technology
KPI	Key Performance Indicator
NGO	None Governmental Organization
NLP	Natural Language Processing
NoSQL	Not only SQL
OAuth	Open Authentication
OLTP	Online Transactions Processing
OSN	Online Social Networks
PaaS	Platform as a Service
PDF	Portable Digital Format
POST	People, Objectives, Strategy and Technology

RDBMS	Relational Database Management System
ROI	Return On Investment
SMA	Social Media Analytics
SMBP	Social Media Business Profile
SQL	Standard Query Language
UGC	User Generated Content
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
WoM	Word of Mouth
XML	eXtensible Markup Language

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List of Publications

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CHAPTER I

Research Problem

1.1. Introduction

Evolution of web 1.0 to web 2.0 allows users to generate content and communicate with each other and with businesses instead of only organizational generated content (Đurković et al., 2016) which was the theme of web 1.0. The number of active users of social mediaworldwide is growing exponentially and reaches70% of internet users at 2016 (Kanuri et al., 2018) which in turn lead to availability of massive amounts of data. Businesses have been utilizing this spread of use and increasing expenditures related to social media efforts (Cawsey and Rowley, 2016, Moorman,2018) and involving social media in several business activities (Friedman and Friedman, 2013,Malthouse et al., 2013,Recine et al., 2013) such as marketing, sales, IT, information and research, customer services and involving customers in product's co-creation (Kosalge, 2015).

Businesses went beyond use of social media to analyzing content in these platforms using social media analytics(SMA) which adds value to business through providing insights on user's opinions about the brand, product or service, better planning for marketing campaigns, or even gaining competitive advantage by monitoring and analyzing competitor's activities in social media (He et al., 2013), expanding marketing ability through shifting customers from awareness

to engagement level, winning customers' loyalty and advocacy (Hanna et al., 2011), just to name a few.

Businesses from different industries worldwide –such as APC for energy solutions (Recine et al., 2013), Grammy Awards (Hanna et al., 2011), Pizza Hut, Domino's Pizza, Papa John's Pizza (He et al., 2013) –was adopting the use of SMA and realizing value gained from use of these technologies.

However, there is still a resistance from business management regarding investing in social media adoption as well as other effective systems because it found linking the effect of system's adoption with business performance (Bogéa and Brito, 2017) challenging and therefore gaining from these technologies.

Although social media adoption in business and linking business performance to social media performance are active research areas, researches in such topics are not matured yet. To the best of researcher's knowledge the literature that has been produced at the last fifteen years that covers systematically setting a framework for social media strategy in organizations are limited (Tsitsi, 2013,Duane and O'Reilly,2016, El-Din et al., 2017). Moreover, there is limited literature that examined the whole adoption of social media by the business.

1.2. Problem Statement

From the previous section, it has been drawn that social media is used among various businesses to serve different business activities; also, SMA has been applied on business-related content to give purposeful insights for decision making.

Nonetheless, management needs demonstrable results to approve the investment in such initiatives which requires an exact procedure of identifying and selecting the right business performance indicators that could be related to social media performance.

Furthermore, there is a need for better understanding of how social media could be adopted in business through setting a framework for the adoption process; the framework encompasses both the process of social media adoption in business and implementation of social media strategy with focusing on participants and factors affecting adoption success.

Therefore research problem could be formulated as follow:

There is no clear action plan for social media adoption in business, this involves lack in defining actors, stages and most importantly the systematic way of selecting good business performance indicators and corresponding social media performance indicators so that they could be used for making actionable decisions.

1.3. Research Objectives

The main research objective is *developing a framework for social media adoption in business, so that it could be applicable for companies that are intending to utilize social media in the business context*.

Four sub-objectives are yielded from the main objective:

1. Examining the current status of social media adoption by business.
2. Proposing a method for defining relevant performance indicators that should be tracked.
3. Identifying stakeholders and factors that affect adoption process.
4. Validating the developed framework.

1.4. Research Questions

The following research question is formulated from the research problem:

RQ: *How business can gain value from the use of social media inthe business context?*

Sub-questions are formulated to answer the main question and will be examined in the study.

RQ1. *What is the current status of social media use in the business context?*

To answer this question; there was a need for answering the questions below, that requires examining articles related to extant social media platforms and their role in serving business functions, used techniques for analyzing user-generated content (UGC), relationships among users, users' activities on the business website, in addition to studying extant frameworks that had been developed to regulate organizational use of social media. The questions are:

RQ1.1 *What is social media?*

RQ1.2 *What is social media analytics SMA? And what is web analytics?*

RQ2. *How relevant can social media impact on business be effectively identified?*

Answering this question implies having knowledge about business performance perspectives and measuring their performance. Also, learning about social media performance and what are business units that could be affected by the use of social media and relevant social media performance indicators that are required. Answering this question raises a need for answering the following sub-questions.

RQ2.1. *What is the business-performance measurement?*

RQ2.2.*What are business performance indicators that could be tracked from social media, and what are the corresponding social media performance indicators?*

Analyzing social media performance implies reviewing innovative processing paradigms that have the ability to address big data issues; this triggers a new question from the third sub-question, as shown below.

RQ2.3.1. *How to effectively process social media data?*

RQ3:*What are the required processes for adopting social media by business?*

This question triggers the need for extending the extant frameworks through examining two elements and exploring them; namely, stakeholder's requirements in addition to affecting factors.

RQ3.1. *What are the obstacles that may hinder the adoption process?*

RQ3.2. *How can obstacles that emerged in 3.1be addressed?*

1.5.The Thesis Structure

This introductory chapter was discussing the research problem, stating the research objective and related questions, elucidating research design and method followed during the research period and showing what were the research contributions to knowledge.

The rest main five chapters of this thesis are:1) Chapter II which sets the theoretical background of concepts, applications and technologies used in this work, in addition to covering literature on state of the art,2) Chapter III which is an extension to Chapter II so that it covers big data analytics in general and SMA applications in particular, 3) Chapter IV which discusses the proposed solution,4) Chapter V which is going further to show how the framework had been validated, and 5) Chapter VI which is concluding the research, highlighting contribution and limitations. References and appendices are provided at the end of thesis, consequently.

CHAPTER II

Literature review

2.1. Introduction

This chapter and its successor are establishing the theoretical and technical background for this work through investigating literature that covered business performance measurement, social media in the business context, social media implementation frameworks and social media adoption frameworks, and factors that are affecting both adoption and implementation of SMA in business. Furthermore, social media platforms and their business applications will be covered in this chapter. An overview of the online social network that has been used for use cases in Chapter V is provided to support comprehending them later.

Since social media data is attributed to big data and analyzed using big data technologies, big data will be covered in the next chapter.

2.2. Business performance measurement

Before delving into the topic of performance measurement, it is important to define the terminology that is needed to comprehending the performance measurement. The definitions below are based on those by Neely et al. (2001).

- *Effectiveness* means the extent to which stakeholders requirements are met.

- *Efficiency* means how economically resources are utilized in the processes required for meeting stakeholders' requirements.
- *Performance* means achieving the defined objectives efficiently and effectively.
- *Performance measure* is a parameter used to quantify the efficiency and/or effectiveness of a past action. Niven (2014) defined it as a standard for evaluation and communication of performance compared to expected results.
- *Performance metric* could be simplified as it represents the formula(s) needed to get the performance measure (indicator).

Businesses measure performance since they are supposed to reach desired results efficiently and effectively (Van Looy and Shafagatova, 2016). Ancient performance measurement models were limited to financial performance (Stede et al., 2006, Van Looy and Shafagatova, 2016) since they had been developed during the industrial era (Kaplan and Norton, 2005).

Balanced performance measurement models have been developed over the last four decades to address the absence of measurement for non-financial business perspectives through embracing performance perspectives which are not measured using finical terms (Neely, 2004, Van Looy and Shafagatova, 2016).

Well established performance measurement models such as performance prism and balanced scorecards (Ivanov and Avasilcăi, 2014) where considering non-financial performance perspectives too but they tend to identify performance perspectives (aspects) with little care of deriving related performance indicators and metrics of such views (Van Looy and Shafagatova, 2016).

2.2.1. Balanced scorecards

It is four perspectives framework consist of learning and innovation (growth), customer, internal process, financial, and perspectives as shown in figure 2.1.

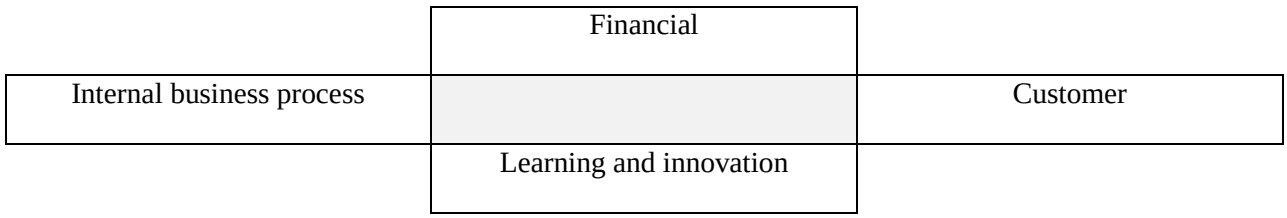


Figure 2.1 Balanced Scorecards by Kaplan and Norton (2005)

Each of the above mentioned perspectives could be defined through answering the following questions (Niven, 2014):

- *Learning and growth*: how business could align intangible assets to improve its capability to support its strategy?
- *Customer:* who are the targeted customers? What are their requirements and expectations from the business? What is the value preposition that should be given to them?
- *Internal process:* in which processes the business should excel to continue adding value to its customers?
- *Financial:* What are the requirements and expectations of financial stakeholders?

2.2.2. The performance prism

This framework consists of five interrelated performance perspectives; stakeholders' contribution, strategies, processes, capabilities and stakeholders' satisfaction as depicted by figure 2.2.

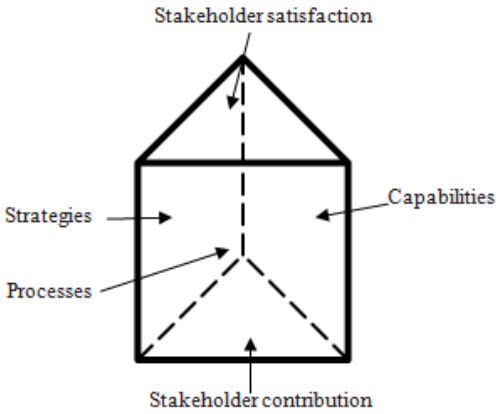


Figure 2.2 Performance prism – Source: Neely et al. (2001)

Neely et al. (2001) stated that there is a need for identifying key components of each perspective by answering questions about each prism facet as shown below:

- *Stakeholders' satisfaction:* who are the vital stakeholders of the business and what are their requirements and needs?
- *Strategies:*what are the strategies that should be setup to meet business requirements and needs from one hand and stakeholders' requirements and needs?
- *Processes:* what are the processes that should be executed to implement the strategies?
- *Capabilities:* what are the right capabilities that are needed to allow efficient and effective execution of the processes?
- *Stakeholders' contribution:* what the business requires and needs from the stakeholders on an exchanged basis?

Although performance indicators are business dependent and in need to be refreshed overtime, Van Looy and Shafagatova (2016) identified and grouped performance indicators on the basis of performance perspectives, and operationalized them through providing formulas or units of calculating each, Van Looy's and Shafagatova's list (2016) assists practitioners in selecting the

performance indicators that serve their business strategy, table 2.1 below contains the complete list.

Table 2.1 A list of performance indicators and corresponding metrics – Source (Van Looy and Shafagatova, 2016)

Perspective	Indicators	Operationalization
1. Financial performance	Sales performance	(Achieved total sales/planned sales)*100
	Inventory turnover	(Annual total sales/average inventory)*100
	Market share	% of growth in the last years (Sales volumes of products and services/total market demands) *100
	Earnings per share (EPS)	(After-tax net earnings - preferred share dividends)/weighted average number of shares outstanding
	Average order value	Aggregated monthly sales/monthly number of orders
	Order growth	Number of orders in the current month/total number of orders
	Revenue growth	(Revenue from new sources/total revenue)*100
	Operating revenue	Sales revenues
	Return on investment(ROI	1. After-tax profit or loss/total costs 2. (Revenue – cost)/cost

Perspective	Indicators	Operationalization
	)	
	Return on assets(ROA)	After-tax profit or loss/average total assets
	Circulation of assets	(Operating revenues/assets)*100
	Current ratio	(Current assets/current liabilities)*100
	Net profit margin	1. After-tax profit or loss/total operating revenues 2. (Total operating revenues -operating expenses - non-operating expenses)/total operating revenues
	Profit per customer	After-tax earnings/total nr of online, offline or all customers
	Management efficiency	Operating expenses/(operating revenues*100)
	Debt ratio leverage level	Debts/assets
2. Customer performance	Customer complaints,	1. Number of complaints, criticisms or notifications due to dissatisfaction about or non-compliance of orders, products and services

Perspective	Indicators	Operationalization
2.1. Customer Performance	returnrate	2. Number or % of orders returned, rework or services to be redone (e.g., incorrect deliveries, incorrect documentation)
	Perceived customer satisfaction	Qualitative scale on general satisfaction, possibly indexed as the weighted sum of judgments on satisfaction dimensions (e.g., satisfaction with products and services, perceived value, satisfying end-user needs, being the preferred suppliers for products or services, responsiveness, appearance, cleanliness, comfort, friendliness, communication, courtesy, competence, availability, security)
	Perceived customer easiness	Qualitative scale on the degree of easiness to find information and regulations, to fill out applications, and to understand the presentation of bureaucratic language
	Customer retention	Number of returning customers
	Customer growth	Number of new customers
	Customer query time, resolution time, response time	Average time between issuing and addressing a customer problem or inquiry for information

Perspective	Indicators	Operationalization
	Customer waiting time	1. Time for information about a product or service + time for following status updates + time for receiving the product or service 2. Max number of customers in the queue or waiting room 3. Handled requests /total requests
	Punctuality, delivery reliability	1. Late deliveries or requests/ total number of deliveries or requests 2. % of On-time deliveries according to the planning or schedule
	Payment reliability	(Number of collected orders paid within due date/ total number of orders) *100
	Information access cost, information availability	1. Information provided/not provided 2. Time spent in asking for information about a product or service (in days) 3. Time required to get updated about the status of a product or service 4. Cost of information (euro)
	Customer cost	Product cost or the cost of using a service (euro)
2.2. Supplier performance	External delays	Number of delayed deliveries due to outage or delays of third-party suppliers
	External mistakes	% of Incorrect orders received

Perspective	Indicators	Operationalization
	Transfers, partnerships	%of Cases transferred to a partner
2.3. Society performance	Perceived society satisfaction	1. Qualitative scale on general satisfaction, possibly indexed as the weighted sum of judgments on satisfaction dimensions 2. % of Society satisfied with the organization's outcomes
	Societal responsibility, sustainability, ecology, green	1. Number of realized ecology measures (e.g., waste, carbon dioxide, energy, water) 2. Quantity of carbon dioxide emitted per man month
3.Business process performance 3.1.General process performance	Process complexity	Number of elementary operations to complete the task
	General process information	1. Number of orders received or shipped per time unit 2. Number of incoming calls per time unit 3. Number of process instances
	Order execution	[Number of executed orders]/ [total number of orders]*100
	Perceived sales performance	Qualitative scale on the successful promotion of both efficiency and effectiveness of sales

Perspective	Indicators	Operationalization
	Perceived management performance	Qualitative scale on the improvement of effectiveness, efficiency, and quality of each objective and routine tasks
	Surplus inventory	1. % of current assets 2. Value of surplus inventory (e.g., pharmaceutical material) to total assets ratio
3.2. Time-related process performance	Occupancy rate	Average % occupancy, e.g., of hospital beds
	Throughput	Number of processed requests/time unit
	Process duration, efficiency	Σ(finish date - start date) of all finished business objects/ number of all finished business objects
	Process cycle time, order cycle, process duration, average lifetime, completion time, process lead time	1. Time for handling a process instance end-to-end 2. Aggregated time of all activities associated with a process (per instance) 3. Application submission time − application response time
	Average sub-process	Sub-process start time − Sub-process finish time

Perspective	Indicators	Operationalization
	turnaround time, task time, activity time	
	Processing time	Time that actual work is performed on a request
	Average order execution time, order fulfillment time, order lead time	(Σ(Dispatch time - creation time)/(total number of orders)*(order entry time))+order planning time + order sourcing, assembly and follow-up time +finished goods delivery time
	Average order collection time	Σ(Collection time - creation time)/number of collected orders
	Average order loading time	Σ(Final distribution time distribution - creation time)/number of loaded orders
	Process waiting time, set-uptime	1. Average time lag between sub-processes, when a process instance is waiting for further processing 2. Time between the arrival of a request and the start of work on it (=time spent on hold) 3. Average waiting time for all products and service

Perspective	Indicators	Operationalization
	Manufacturing cycle efficiency	(setup time + (number of parts * operation time))/ manufacturing lead time
	Manufacturing lead time	Setup time+(number of parts * operation time)+queue time + wait time + movement time
	Value added efficiency	Operation time/manufacturing lead time
3.3.Cost-related process performance	Activity cost	Cost of carrying out an activity
	Process cost, cost of quality, cost of producing, customer order fulfillment cost	Sum of all activity costs associated with a process(per instance)
	Unit cost	Number of employees (headcount) per application, product or service
	Information sharing cost	Time for system data entry + time for system delivery output
3.4.Process performance	Quality of internal out	1. %of instance documents processed free of error 2. Number of mistakes

Perspective	Indicators	Operationalization
related to internal quality	puts, external versus internal quality, error prevention	3. Number of tasks with errors/ Total number of tasks perprocess 4. Number of syntactic errors 5. Number of repeated problems
	Deadline adherence, schedule compliance, due date performance effectiveness, responsiveness	% of Activity cycle times realized according to the planning or schedule (Number of finished business objects on time /number of all finished business objects) * 100
	Process yield	Multiply the yield per process steps,e.g., $(1-\text{scrapparts/total parts})^{step1} * (1-\text{scrapparts/total parts})^{step2}$
	Rework time, transaction efficiency	1. Time to redo work for an incident that was solved partially or totally incorrect the first time 2. Average time spent on solving problems occurring during transactions
	Integration	Time to access and integrate information

Perspective	Indicators	Operationalization
	capability	
3.5. Process performance related to flexibility	Special requests	Number of special cases or requests
4. Learning and growth performance 4.1.(Digital) innovation performance	Degree of digitalization	1. % Reduction in processing time due to computerization 2. Number of process steps replaced by computer systems / Total number of steps in the entire process 3. Number of digital products or services
	Degree of rationalization	% of Procedures and processes systemized by documentation, computer software, etc.

Perspective	Indicators	Operationalization
	Time for training on the procedure	Measured in hours
	Novelty in output	Number of new product or service items
	Customer response	Number of suggestions provided by customers about products and services
	Third-party collaboration	Number of innovation projects conducted with external parties
	Innovation projects	1. Number of innovations proposed per quarter year 2. Number of innovations implemented per quarter year
	IS development efficiency	1. Number of change requests (+per type of change or per project) 2. Time spent to repair bugs and fine tune new applications 3. Time required to develop a standard-sized new application 4. % of Application programming with re-used code
	Budget for IS training	(IS training budget/overall IS budget)*100

Perspective	Indicators	Operationalization
	Relative IT/ IS budget	((Total IT/ IS budget)/(Total revenue of the organization))*100
	Budget for buying IT/IS	((Budget of IT/IS bought)/(Total budget of the organization)) * 100
	Budget for IS research	(IS research budget/ overall IS budget)*100
	Perceived management competence	Qualitative scale on the improvement in project management, organizational capability, and management by objectives (MBO)
	Perceived relationship between IT management and top management	Qualitativescaleontheperceivedrelationship,timespentinmeetingsbetweenITandtopmanagement, and satisfaction of top management with the reporting on how emerging technologies may be applicable to the organization
4.2. Employee perfor	Perceived employee satisfaction	1. Qualitative scale on general satisfaction, possibly indexed as the weighted sum of judgments on satisfaction dimensions 2. Qualitative scale on satisfaction about hardware and software provided by the organization

Perspective	Indicators	Operationalization
mance		
	Average employee saturation, resource utilization for process work	1. (Time spent daily on working activities/total working time) *100 2. Work time/ available time 3. % of operational time that a resource is busy
	Resource utilization for digital innovation	1. IS expenses per employee 2. % of Resources devoted to IS development 3. % of Resources devoted to strategic projects
	Process users	Number of employees involved in a process
	Working time	Actual time a business process instance is being executed by a role
	Workload	Number of products or services handled per employee
	Staff turn over	%ofEmployeesdiscontinuingtoworkandreplaced,comparedtothepreviousyear
	Employee retention,	% of Employees continuing to work in the organization compared to the previous year

Perspective	Indicators	Operationalization
	employee stability	
	Employee absenteeism	(Total days of absence / total working days for all staff)*100
	Motivation of employees	Average number of overtime hours per employee
	Professional training, promotion and personal development	1. % of Employees trained 2. % of Employees participated in a training program per year 3. Number of professional certifications or training programs per employee
	Professional conferences	% of Employees participating in conferences

Examples of performance indicators in the list of Van Looy and Shafagatova (2016) and others such as those developed by Heijnen et al. (2013) were revenues, return on assets, cost-saving, market share, customer satisfaction, customer retention, employee satisfaction, employee turnover, workforce, productivity, process cycle time, employee certification, new product or service development cost.

It is worthy to say that, from the wide range of performance indicators, only those related to business objectives and could be tracked from social media data should be focused on, and metrics for measuring them should be identified (Heijnen et al., 2013).

2.3. Social Media in Business

Social media is a complementary tool cooperating with other media channels such as traditional media channels; therefore, SMA and web analytics should be considered too, since they provide metrics that reflect progress in some business performance indicators and how business profiles in social media are supporting business performance indicators such as revenue generation (Etlinger and Li, 2011), customer loyalty (Zhang et al, 2015), customer engagement (Zhang et al, 2017), sales (Castronovo and Huang, 2012), brand awareness (Miller and Lammas, 2010,Jamali and Khan,2018), reputation management (Dijkmans et al., 2015), purchase decision (Miller and Lammas, 2010) and other performance indicators. However, among all business processes, social media is more affecting on customer relationship management (CRM) related processes (Etlinger and Li, 2011). Topics about partners' relations, operational performance and environmental performance are hard to be posted in social media which makes tracking performance indicators difficult for such perspectives (Heijnen et al., 2013) challenging. Moreover, social media is not an efficient channel for direct revenue; instead, it is used for leads generation and conversions (Etlinger and Li, 2011).

Identifying performance indicators that would be targeted with social media effort and concentrating on activities that are achieving business goals are vital issues for business that is intending or already adopting social media. Furthermore, measuring the performance of social media is required for the sake of evaluating and adjusting social media strategy (Hofmann, 2019). Achievement of social media objectives is measured through web analytics and SMA techniques that use related social media and web metrics (Duane and O'Reilly, 2016). Both techniques will be covered in chapters three and four.

2.4. Social Media Implementation (Strategy) Frameworks

Social media implementation frameworks (also called models in literature) are focusing on the development of social media strategy; some of the well-documented frameworks are presented in this section with demonstrations of ingredients of social media strategy that has been extracted from these frameworks.

Gass (2009) encouraged organizations to work on each component of their people, objectives, strategy and technology (POST)framework in the same order as they had been indicated by model's name; so organization should start with categorizing *people* (customers/ prospects) according to their activities in social media and review channels that will be adopted, then defining *objectives* that should be reached from connecting with customers, and the *strategy* that should be followed to achieve business goals and measuring achievement, and used *technologies* by customers should be implemented then, and results should be measured.

A model of six components was developed by Content Connections LLC for validating underlying content and building a growing community around it, called ACCESS (audience, concept, competition, execution, social media and sales viability), this model was adopted by Safko and Brake(2008). Safko and Brake(2008)suggested that audience spectrum should be

segmented into groups based on their needs, preferences, behaviour (self-reported and demonstrated),values, attitudes, beliefs, demographic information to facilitate customizing disseminated messages. Also, influencers and promoters should be identified and attracted to join the audience because of their value in viral marketing and word of mouth WoM. Moreover, the concept (product, service, business or even a political candidate) that will be promoted should be identified according to the targeted audience, a community should be built around it, and its distinct qualities over competitors' concepts should be stressed. Eventually, a content that presents the concept to the audience in textual or multimedia format is published (executed) in social media platforms. Sales viability is the sixth component of the framework which resulting from the integration of the elements mentioned above: audience, concept (object), competitors, social media and execution.

Kooi (no date) highlighted Kerkhofs's marketing-oriented model, which was stressing on the importance of mind shifting organization culture to accept social media involvement. Kerkhofs's framework was suggesting the conduction of market research to show organization's position compared to its competitors, then identifying the problem that needs implementing social media to be addressed or opportunities that could be seized through utilizing social media, after that, goals that should be reached and targeted *audience* group should be identified in the same way of Audience, Concept, Competition, Execution, Social Media, and Sales Viability (ACCESS) model's methodology, then *strategic options* should be defined in a structured way, and elaborate all previous phases, next, specification of to be used technologies takes place. Eventually, the organization should determine whether social media is suitable in its case and deserves investing in or not. If the taken decision was going ahead, then the implementation

should take place and performance of social media channels is measured (Kooi, no date, Tsitsi et al., 2013).

Social media strategy is defined by Ng and Wang(2013) as “a well-defined and tightly focused social media action plan, which has clear business objectives, specific policies, desired audience, desired resources and predefined metrics for measuring the social media impacts”.

The definition by Ng and Wang (2013) among others will be adopted, and ingredients of social media strategy will be discussed in the next section except for metrics which will be discussed in the context of SMA in the next chapter.

2.4.1 Objectives identification and measurement: the ultimate goal of using social media in business is to improve organizational performance in some areas, which in turn operationalizes organization’s strategy. It is worthy to state that social media does not affect all business types (Lacka and Chong, 2016;Werder et al., 2014) and business functions; this could be attributed to two reasons, consecutively: 1) B2B entities are invisible to customers like B2C entities and therefore their customers are not engaged in online communities like their B2C counterparts, this in turn affect business engagement in social media. 2) people tend to show their opinions in some products like consumables more than in other products that has long life (Heijnen, 2012).

Objectives of social media use should serve objectives of business units that will be affected by the use of this technology (Kosalge,, 2015, Kleindienst et al., 2015) and have performance indicators could be tracked from (Heijnen et al., 2013), since these business units are interacting with customers/ prospects and employees, which in turn generates a considerable amount of UGC (Kleindienst et al., 2015) that could be analyzed and engaged.

Identifying business objectives and obtaining performance indicators are vital steps in performance measurement system (Sidorova et al., 2016) and recognized as a necessity in previous social media adoption frameworks such as those provided by El-Din et al.(2017) and Duane and O‘Reilly (2016). Examples of objectives of business units are improving brand reputation, awareness, generating revenues, improving customer satisfaction and services (Lee, 2018). Furthermore, business objectives have to be linked with social media objectives (Werder et al., 2014).

2.4.2 Content and audience: although websites of vendors of content management and SMA such as Sprout and Hootsuite (Kanuri et al., 2018) are full with demonstrations of planning for successful social media marketing strategy, available literature in academia is focusing on isolated dimensions of social media strategy, which originate a need for more investigation and synthesis for these dimensions. Typical social media strategy considers learning about audience and competitors and targeting the audience with specific, exciting content as an essential activity for the success of the strategy. Scholars like Hofmann (2019), Zhang et al. (2018), Kanuri et al.(2018) in addition to Pepe and Bournique (2017) had shown the importance of creating an engaging content that is positively affecting audience engagement with social media business profiles (SMBPS). Furthermore, both of Kanuri et al. (2018) and Pepe and Bournique (2017) added that scheduling of publishing posts is essential as well. Pepe and Bournique (2017) state that marketing effort should target a specific group(s) of the audience, which implies, firstly, defining the group (Hofmann, 2019) based on criteria such as demographics (Phorest, 2017) and interests (Safko and Brake, 2008).

2.4.3. Social media policy and resources: social media policy should state acceptable and non-acceptable behaviour of employees in social media (Sharma and Bhantagar, 2016, Hofmann, 2019). Furthermore, policy has to be aligned with regulations of human resources, which puts the onus of designing, implementing social media strategy and budgeting software needed for social media adoption upon social media team (Sharma and Bhantagar, 2016).Defining who will be responsible for publishing and replying on official SMBPs is indispensable for the sake of accountability, the official could be a representative of public relations, another beneficiary business unit (Hofmann, 2019) or entire business (Werder et al., 2014). Formalizing organizational use of social media through identifying internal actors of social media, their responsibilities and rules that police their use of social media was indicated in adoption frameworks by (Werder et al., 2014, Duane and O'Reilly, 2016).

2.5. Social Media Adoption Frameworks (Models)

Social media adoption frameworks are more inclusive than implementation frameworks, since they represent the action plan that includes activities needed for adopting social media as a business process that requires an infrastructure in addition to social media *implementation* (strategy)to be achieved.

Werder et al.(2014)in their framework that has been established upon three components: the *scope* of adoption strategy which involves selecting most fitting social media platform(s), identifying actors and interactions among them and considering affecting factors such as religious, sexual and nationality identities and used language. *Capabilities*is the second component that gives the organization an advantage over its competitors through setting the right objectives and activities needed to achieve them; authors suggested deriving social media

objectives from business objectives so that they support them. The third component is *governance* which involves measuring the value gained from social media through identifying and tracking key performance indicators (KPIs), allocating resources which firstly need authorities to be defined to prioritize needs correctly and explain responsibilities of the social media team and the last governance aspect is mitigating various risks that are originating from social media external users in addition to internal users through developing and communicating social media policy.

El-Din et al.(2017) in their model suggested that enterprise should go through four phases during the journey of social media adoption, namely:1) *experimentation* which involves defining objectives of social media adoption, understanding and analyzing the prospected social media platforms, determining who is responsible of social media activities and making a presence for enterprise in some social media platforms, then 2) *partial integration* where enterprise assists staff to understand qualities of social media and use it efficiently, after that, 3) *complete integration* where social media strategies are formulated, more specialized actors and responsibilities are identified for social media management and social media turn to everyday activity in departments (for example recruitment in HR and blogging and communication between managers and executives),the last stage is seeking, 4) *monitoring and evaluation* of social media activities' impact.

The framework considered the factors that are affecting the adoption process such as technological, environmental and organizational factors.

The framework that had been developed by Dowson (2009) from Advanced Human Technologies Group; suggested that business's staff should *learn to utilize* social media by using it themselves, learning senior executives, analyzing others experiences, hearing from

practitioners and exploring most recent trends. Then the organization should go in two parallel paths. One path is focusing on *listening* and is requiring identification of social media tools that will be used, and exploring them well, then, finding related communities and conversations by knowing what is said about the business in social media, also crucial influencers should be identified at this phase. Then, firm should positively *engage in conversations,* add valuable content and engage with key influencers. Next, measures to evaluate performance of social media activities has to be identified, monitored to be reported to senior executives and to refine the strategy. The other path is focusing on strategies development and starts with *prioritizing objectives* of social media to focus on most important ones in social media strategy development. Then, *establishing governance* which requires identifying opportunities, setting social media policy, and communicating it internally in addition to understanding risks originating from social media or even not engaging at all. The last phase is *defining activities* such as identifying the order of steps that should be followed for strategy implementation, making a presence on selected social media platforms, setting responsibilities and deadlines, identifying required resources and linking social media activities to offline marketing activities. *Developing capabilities* is a continuous activity that should not be stopped at all; it contains sub activities such as identifying outperforming social media actors, training them and the rest of staff and continuous development and lunching pilot program.

Table 2.2 summarizes contributions of existing frameworks and their shortcomings and the reflection on research, these frameworks will be more studied in a critical manner and linked to results from primary data analysis in section 4.5.

Table 2.2Strengths and weaknesses of existing frameworks

Author, framework	Findings/ contribution	Shortcomings
El-Din, et al. (2017), A model for social media adoption in social enterprises: a comparative analysis with existing adoption model.	The four stages adoption model for social enterprises considered factors that influence adoption process such as environmental, organizational and technological.	1. Concerns only RoI to evaluate effect of social media. 2. Dealt with audience as a bulk (no target groups).
Werder et al. (2014), Social media for success: a strategic framework.	1.Built a three staged strategic social media framework that has taken business strategy and risks identification and mitigation into account. The framework also considered racial, common language, sexual, religious, and nationality based issues when dealing with external actors. 2.Linked between social media objectives and business objectives and suggested using purposeful metrics to evaluate social media impact.	1. Requirements gathering conducted by interviewing only 8 internal actors from only one industry may affect generality of results 2. Social media policy not considered 3. Validation done by 2 academics and two professionals
Human Advanced Technologies (2009), social	An adoption and implementation model had	Ignored importance ofhaving criteria for

Author, framework	Findings/ contribution	Shortcomings
media strategy framework.	the qualities of , setting and communicating social media policy, considers identifying responsibilities, developing capacities and identifying outperforming internal actors	platform selection
Safko and Brake (2009), The social media bible: tactics, tools and strategies for business success *Note:* The authors were adopting ACCESS model.	1. An implementation model was concentrating on providing the right content for the right segment of audience. 2. Was taking content of competitors into account	1. Main focus is on monetary return 2. Ignored setting criteria for platform selection
Gass, 2009. Four-step approach to a social media plan.	An implementation model based on categorizing people according to their activities in SM and review channels then defining objectives from engaging with them, setting strategy to achieve these objectives and measuring level of achievement after implementing technologies.	

2.6. Factors that are Affecting Social Media Adoption

In the next subsections, factors that affect the adoption of social media in business will be examined; identifying such factors assists in addressing problems caused by them or at least fairly judging adoption process.

2.6.1.Results demonstrability

The most critical factor for success or failure of using social media in an organizational context is management support. Management support mainly relies on results (social return on investment (ROI)) demonstrability since it justifies investing in social media (Buhalis and Mamalakis, 2015). Social ROI is the extent to which results of adopting technology are visible within the organization, in addition to employees' ability to report the results to other stakeholders. Bogéa and Brito (2017) assumed that although a system is useful, it may not be adopted if users found it difficult to link the effect of system's adoption with job performance.

2.6.2. Skills and capacity building

In general, the success of IT projects including social media adoption is partially affected by skills of participating employees, their ability to provide technical support (Michaelidou et al.,2011, Chin et al, 2015) and presence of up-to-date capacity building programs that conform business needs.

It was evident from the previous subsection that management willing to adopt social media is a crucial factor for allocating resources; including human resources, budgeting training programs and infrastructure for information and communication technology (ICT). Locally, massive outward immigration of Sudanese professionals led to brain drain (Strachan, 2016) and therefore

a lack of qualified IT employees which is another factor affecting employment in various jobs including ICT.

2.6.3.Policies

Most ICT related legal regulations set before the social media era; this led to a shortage of covering issues that are touching online activities. Issues like privacy, data protection and publishing accurate data in official social media profiles should be considered (Hoffmann, 2019). In the case of Sudan; informatics crimes law had been approved at 2007 and updated in 2020, this gives business the advantage of referring to such law and adds custom regulations to their social media policies so that they stay consistent with it.

2.6.4. Diffusion of technology infrastructure

Social media is one of marketing channels, the role of this component is shrunken in Sudan since the percentage of Sudanese people, businesses and organizations using the internet are still small and concentrated in cities and some rural areas. Statistically, the internet penetration rate in Sudan at Dec. 2019 was only 29.6% (10,886,813) of population, and 12% (1,300,000) of them are subscribers to the most commonly used social media platform in Sudan, Facebook (Internet World Stats, 2020), which makes social media the communication channel with relatively limited audience among others.

2.7. Social Media Platforms

As discussed in the previous section, social media assist in achieving various business functions. This section covers social media platforms and their applications in business.

2.7.1. Online social networks

Online social networks or shortly, social networks are web services allow users to create a profile, specify people with whom he\ she wants to connect (Neuendorf, 2017), communicate, share and interact with content in such networks. In the business domain, social networks are used for marketing (Đurković et al.,2016,Zhang et al.,2017, Wang and Kim, 2017), recruitment (Đurković et al., 2016), improving business image (Aichner and Jacob, 2014)and providing team communication and collaboration especially in enterprise social networks(Cardon and Marshal, 2014) which are usually adopted by multinational organizations. However, enterprise social networks are not perceived as one of the most effective communication mechanisms (Ellison et al., 2015).

LinkedIn(Holsapple et al., 2014), Facebook and MySpace are examples of public social networks; Yammer (Microsoft, 2020) and Telligent (Telligent, 2020)are examples of enterprise social networks(Ellison et al., 2015).

2.7.2. Blogs and micro-blogs

The blog is a collection of articles or posts written by bloggers who aim to share their ideas with others, bloggers are writing about their interests, daily activities (Nagi et al., 2015) or about a specific issue as required by their businesses. Often, all websites of giant organizations have a blog that highlights their products and services, Apache, Facebook, and Amazon AWS are examples. Micro-blogs are similar to blogs but with a restriction on the length of the post (Nagi et al., 2015). Micro-blogs are used in marketing (Xue, 2017, Zhang et al., 2018) meanwhile blogs are used for improving business image (Đurković et al., 2016) and information sharing such as product tests (Aichner and Jacob, 2014).Examples of blogs are Blogger (Holsapple et al.,

2014)and blogs at organizations web sites as mentioned before. Twitter (Holsapple et al., 2014) and Tumbler are examples of micro-blogs (Aichner and Jacob, 2014).

2.7.3. Review sites

Review sites are online communities where people exchange their opinions regarding a product or a service; review sites are useful tools for users purchase decision (Cho and Chan, 2018).Yelp and OpenRice are examples of these websites.

2.7.4. Multimedia sharing sites

Used for organizations and individuals for sharing multimedia content with other people on the web (Nagi et al., 2015), businesses are using multimedia sharing sites for advertisement (Đurković et al., 2016). Flicker, Instagram and YouTube (Holsapple et al., 2014) are examples of such sites.

2.7.5.Social bookmarking sites

Users of social bookmarking sites are following, bookmarking web pages (topics) of their interest and sharing them with friends (Nagi et al., 2015). Social bookmarking sites can be used for marketing or even as an indicator of the popularity of the business website (Aichner and Jacob, 2014). Delicious (Holsapple et al., 2014) and Pinterest (Đurković et al., 2016) are examples of social bookmarking sites.

Other types of social media platforms are Wikis such as Wikipedia (Holsapple et al., 2014) and Wikiliks and virtual reality worlds such as Active World (Nagi et al., 2015) which are used forsales (Aichner and Jacob, 2014) and Second Life's TMP Island for employment interviews (Stair and Reynolds, 2010).Not all social media platforms serve business at the same level, but

they have varying importance for business. Figure 2.3 shows variations in the importance level of social media platforms when they are used in a business context.

Type of social media	R&D	Marketing	service	Sales	HR	Organisation
Blogs	◔	◑	◔			
Business networks					●	◔
Collaborative projects	●					
Enterprise social networks	◕				◑	●
Forums	◑	◔	●			
Microblogs		◕	◔		◔	
Photo sharing		◑				
Products/services review	◔	◑		●		
Social bookmarking		◑				
Social gaming		◑				
Social networks	◔	●	◑		◔	◔
Video sharing		●	◔			
Virtual worlds	◔	◕		◔		

Importance: (empty) none or almost none; ◔ low; ◑ medium; ◕ high; ● very high

Figure 2.3 Importance levels of social media platforms in the business context –Source (Aichner and Jacob, 2014)

As indicated in figure 2.3, *online social networks are surpassing other social media applications concerning business areas in which they can help; and now we can also add sales to social networks since Facebook's shop now allows businesses to open online outlets on Facebook and Instagram (Facebook Business, 2020), this was one reason of choosing online social networks as a representative of social media in this work.*

Thorough understanding of qualities of social media platform(s) that will be adopted by business,data formats(structured, semi or unstructured) and analytics mode (batch or real-time) aremust for developing analytics system with modules required for ingesting data from such platforms, storing, processing and visualizing results, so the details of big data environment are covered in the next chapter. Due to heterogeneity of social media platforms, in terms of network structure, application programming interfaces (APIs) used for providing data to consumers (analytics/ processing systems) and difficulty of covering the design and relevant APIs of each

social media platform; Facebook will be introduced in the next section as an ideal social media platform, and its graph and graph API will be discussed. *Another reason of selecting Facebook among other platforms for demonstration of use cases was its domination among others in Sudan where the study was conducted*, as proven from study result (table 2.3) and international statistics as shown in figure 2.4(Statcounter.com a, 2020).

Table 2.3Mostly used social media platforms among employees

Platform	Having a personal account	
	Frequency	Percent of cases
Facebook	105	96.3
Twitter	40	36.7
LinkedIn	49	45.0
Instagram	41	37.6

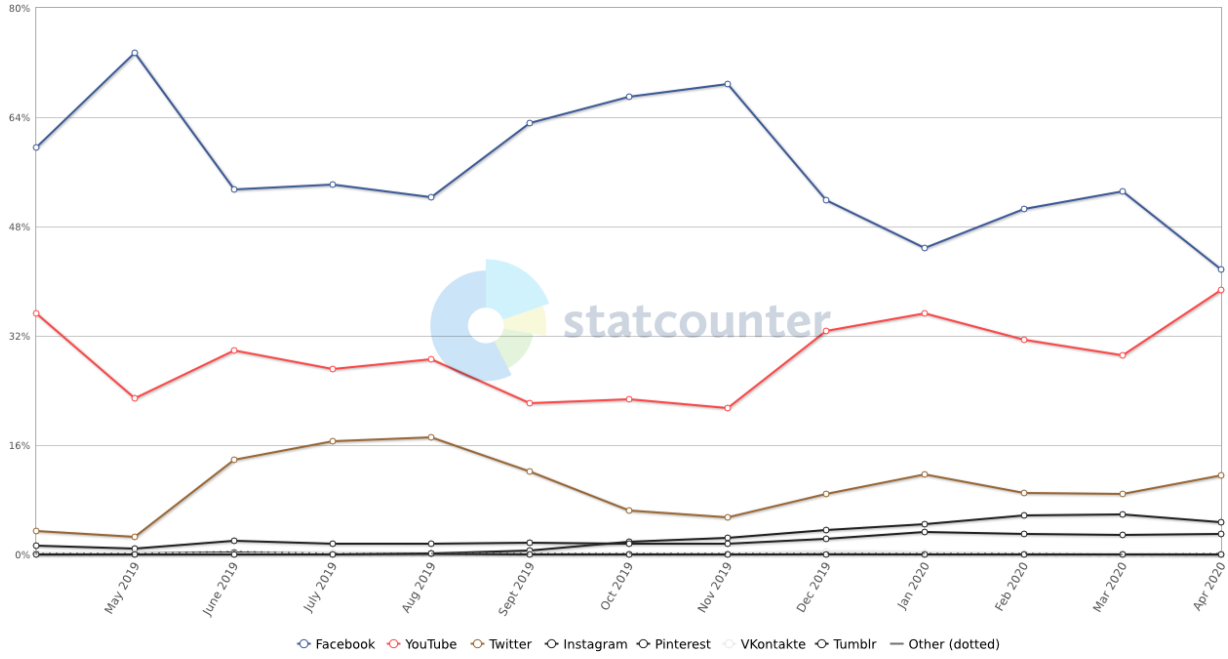


Figure 2.4Social Media Statistics Sudan- Apr 2019 - Apr 2020 – Source (Statcounter.com a, 2020)

2.8.Facebook

Facebook is a social network introduced at 2004 for Harvard University students in Masachitus with the name the thefacebook, then it becomes available for more than 800 universities in United States of America, and then for upper secondary school students at October 2005. Facebook (the name has been changed at September 2005) was becoming available for members of academic institutes outside of United States of America, at 2006 it becomes available for all people worldwide, not only for those from academia (Brügger, 2015).

Figure 2.5shows that Facebook owes the largest number of users worldwide, among other social media platforms.

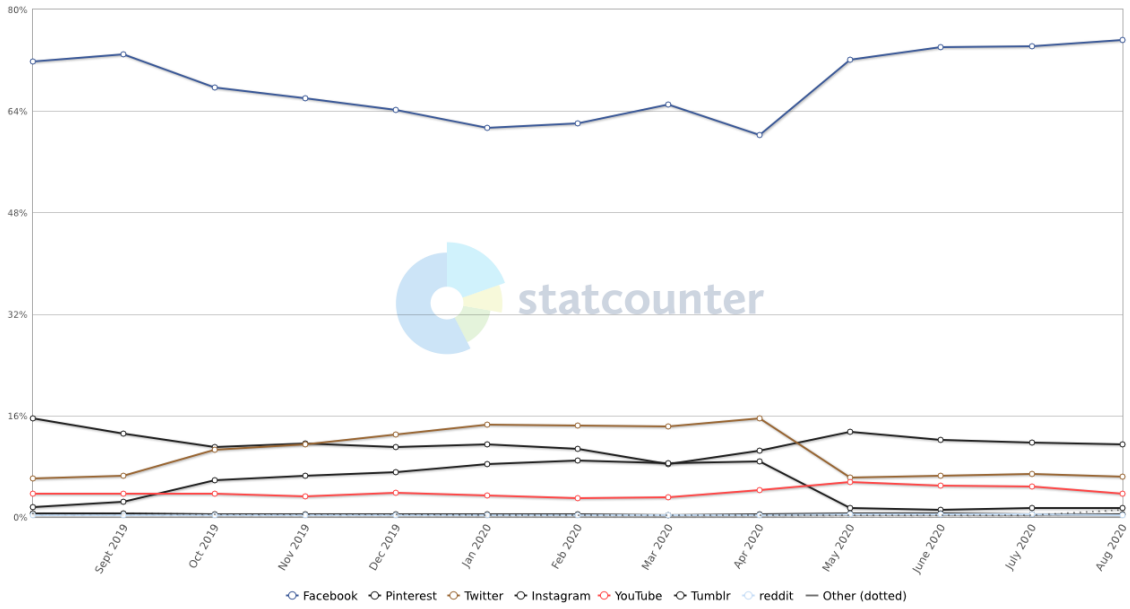


Figure 2.5:Social Media Statistics Worldwide Aug 2019 - Aug 2020 – Source (Statcounter.com b, 2020)

2.8.1. Structure

Facebook is a property graph with nodes and edges representing relationships among them; property graph will be covered in the next chapter. The node could be a user, page, group, place,

photo, post, place, etc., and edge could be a like, check-in, comment, share, etc; figure 2.5 depicts agraph with two nodes and edges associated with them.

Each node or edge have unique id and attributes (metadata) varies according to node type; attributes could be type, name, birthday for user and title for the page, etc. Descriptions of Facebook root nodes and their attributes are provided by Facebook's documentation (Facebook for developers a., 2018).

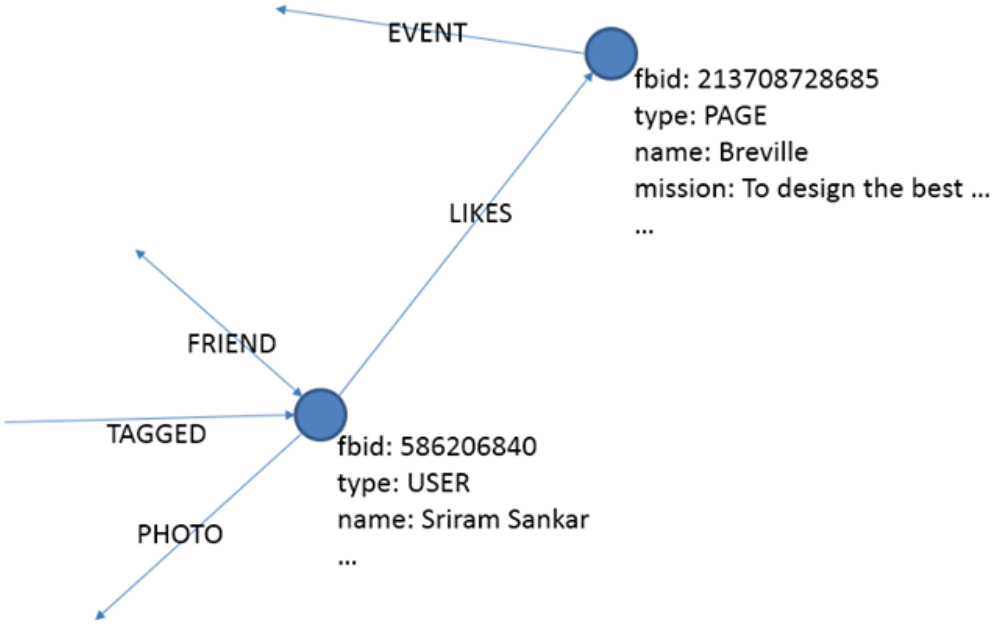


Figure 2.6: Exemplary nodes and edges in Facebook - Source(Facebook Engineering, 2013)

2.8.2. Querying Graph API

Social media platforms are providing application programming interfaces (APIs) that allow the third party's web applications to access social media data (Lee, 2018). Facebook's Graph API allows developers to read –programmatically- from the Facebook graph, write into, delete from and update its objects. An HTTP request is sent to graph.facebook.com for querying almost all data from the Facebook graph (Facebook for developers b., 2018). Querying Facebook graph requires the following steps (Facebook for developers b, 2018, Facebook for developers c, 2018).

1. Having a Facebook account(at https://facebook.com/)and then creating a developer account at https://developers.facebook.com/.
2. Authenticating application through Open Authentication (OAuth) protocol to allow accessing Facebook's data (Singh and Shashi, 2017) through creating a new application ID and looking up for application secret, then constructing the access token in the following format:
   access_token = app_id + "|" + app_secret.
3. Getting node ID, which is the last part of the node's web page uniform resource locator (URL).

To elucidate the process of querying Facebook, the researcher provided an example query for retrieving some posts' information from a page called Balloony, query parts are explained in figure 2.6 where the researcher has page administrator role.

*https://graph.facebook.com/v3.2/balloony/posts/?limit=100&access_token=**********|**********&fields=message,link,created_time,type,name,id,comments.limit(0).summary(true),shares,reactions.limit(0).summary(true)*

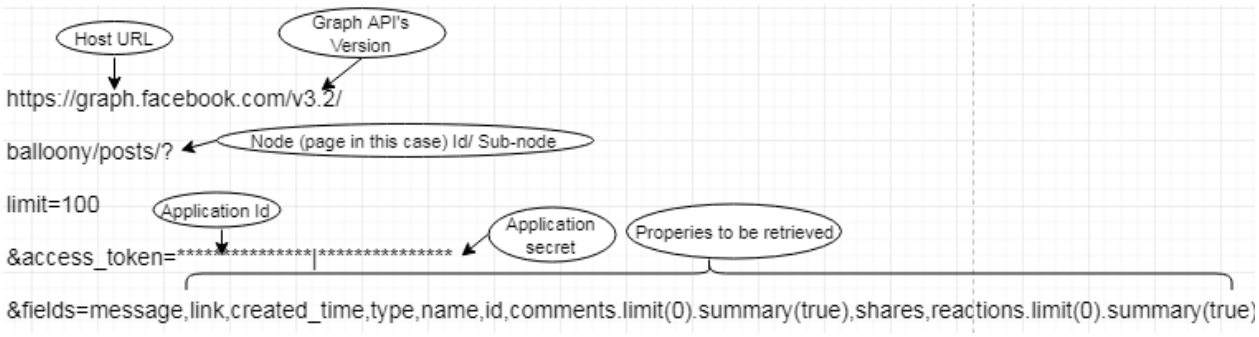


Figure 2.7 Anatomy of the exemplary query to Facebook's graph API

2.9.Summary

This chapter partially sets the theoretical and technological background for the research through examining literature related to implementing and adopting social media, highlighting the role played by social media in business, introducing components of social media strategy and cover social media platforms and their business applications. Finally, Facebook has been discussed as an ideal social media platform in terms of its structure and related APIs to show how data accessed in such platforms.

The next chapter is an extension of this chapter; so that, it is highlighting the topic of big data and social media analytics which falls under the umbrella of big data analytics.

CHAPTER III

Big Data Ecosystem

3.1. Introduction

The exponential growth of data and thevariety of emerging data sources in the last few decades provided a gold mine for both industry and academia. Such data is related to various areas such as social astronomy, computer networks, medical and biological data is produced from heterogeneous data sources. This data have been motivating researchers to exploit them to provide informative insights for problems in both academia and industry. Data sources are including but not limited to satellites, social networks, sensors, and web servers. The data produced from sources mentioned above are attributed to big data, where special processing requirements are must for analyzing or processing and visualizing them or the results of analyzing them. Majority of parts in this chapter have been elicited from the researcher's survey paper about big data ecosystem (Hamid, 2020). The chapter is examining big data and big data ecosystem as an incubator of social media analytics. Then, social media analytics and web analytics techniques are also covered.

3.2. Big Data Definitions

In their comparative study for defining big data, Emmanuel and Stanier (2016) have defined big data from three dimensions; characteristics of data, processing and supporting architectures, and

the applications of data. Interaction of attributes of big data, processing mechanisms and architectures and applications implies accompanying the three perspectives when defining big data (Emmanuel and Stanier, 2016).The three definitions will be introduced in the next subsections and followed by the author's definition for big data.

3.2.1. Data characteristics

The widely introduced definitions of big data are based on characteristics of data known in the literature as the 3Vs; namely, variety, volume and velocity (Emmanuel and Stanier, 2016).

- **Volume**: volume is a critical attribute of big data among others (Zhou et al., 2015, Emmanuel and Stanier, 2016). There is no defined threshold for volume, so it is a relative term given when the volume is too massive to be stored and processed by traditional processing capabilities (Zhou et al., 2015). The volume of big data is a result of data generated from sources such as online social networks, sensors, and e-business transactions, to name a few. Volume is a result of variety and velocity as we will see next.
- **Variety**:in big data context, variety indicates embracing - in addition to structured data - semi-structured and unstructured data (Venkatraman et al., 2016, Venkatraman and Venkatraman, 2019) that is not compatible with relational databases; as a result, noSQL databases turns dominant in the area of big data as we will see later in this chapter. The variety comes from the fact that, nowadays, almost every application generates data is connected to the internet (Emmanuel and Stanier, 2016). Therefore, a heterogeneous data in forms of plain texts, videos, images, audio recordings, geo-location data and data of business transactions are available (Emmanuel and Stanier, 2016) and could be beneficial for business if it was analyzed and reported to the right person.

- **Velocity:** velocity could be defined as the speed at which the system gathers, stores and processes data with reference to (near) real-time (Zhou et al., 2015,Emmanuel and Stanier, 2016), high velocity is a result of the high rate of data updates in a short period.

3.2.2. Processing and supporting architectures

Definitions based on processing and supporting architectures are also common in literature.

Defining data concerning the processing and supporting architectures associates big data with processing requirements. Therefore, it defines big data architectures and processing mechanisms -instead of defining characteristics of big data- as architectures that support scalability and needs of processing data with massive volume that may vary in formats and requires a high velocity of data ingestion and processing (Emmanuel and Stanier, 2016).

3.3.3. Applications on big data

The third perspective for defining big data considers uses of big data which in turn drive the architecture and processing mechanisms used in the big data ecosystem. Big data applications include a spectrum of applications fall between big data analytics end and big data online transaction processing Online Transaction Processing (OLTP) end (Emmanuel and Stanier, 2016) which is out of the research scope.

The researcher has defined big data as *environments with a scalable architecture that support requirements of processing massive, heterogeneous and continually and rapidly changing data.*

3.3. Modules of the Big Data Ecosystem

This section is thoroughly highlighting vital modules involved in the big data ecosystem through studying functionality and used technologies. Figure 3.1 shows modules related to functional

requirements of the big data ecosystem, other modules such as modules related to orchestration and security will not be covered.

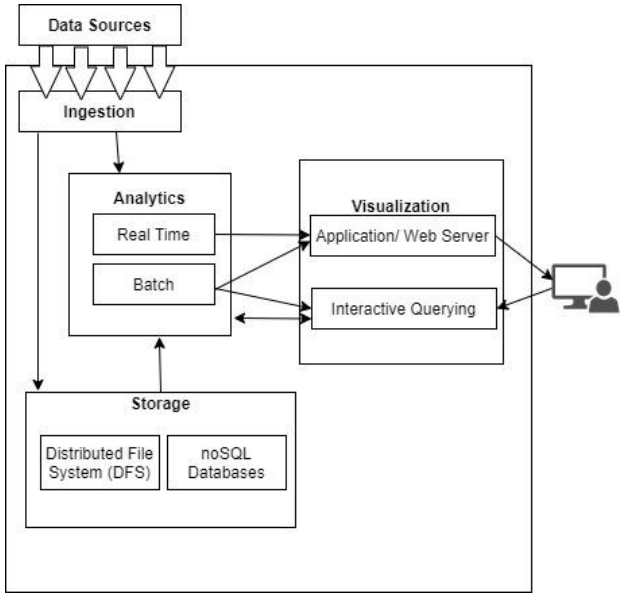


Figure3.1: Big data ecosystem modules – Source (Hamid, 2020)

Big data is collected from various data sources such as social media platforms, mail or web servers and sensors (Petrovska and Ajdari, 2019,Venkatraman and Venkatraman, 2019) etc. After that, it is fed into subsequent processing systems to reflect analytics results to the end-user eventually. Big data ecosystem could be viewed as a system of four interrelated modules; ingestion module, a processing module, storage module and presentation module (Hamid, 2020) will be discussed next.

3.3.1. Ingestion module

Data collected from different data sources is passing through several stages before feeding it to the processing module. Typical ingestion engine is liable of data acquisition, compression/ decompression, filtering, conversion and integration of data (Jagadish et al., 2014,Erraissi, 2018,Semlali et al., 2020). Data connectors in this module ask for authentication from data sources to be able to acquire data (Semlali et al., 2020).

Popular connectors arei) database/ SQL connectors that allow connecting relational databases using APIs, vendors of database management systems (DBMSs) are providing such connectors, Sqoop is an example tool used to exchange data between RDBMSs such as Oracle and MySQL and Hadoop Distributed File System (HDFS) (Sqoop. Apache, no date), ii) proprietary (or open-source) connectors, iii) custom connector (Bahga et al., 2016) designed for particular data source through implementing APIs available by the data source. The well-known communication models adopted by connectors of real-time (stream) data sources are :i) publish-subscribe messaging where interaction is taking place among a subscriber (consumer), publisher (data source) and a broker. In this model, the publisher sends messages to the broker who manages several topics (messaging queue), and subscribers (consumers), in turn, pull messages from the broker who had received messages from the publisher(Bahga et al., 2016, VD et al.,2016). Apache's Kafka and Amazon's Kenisi are example frameworks implementing publish-subscribe messaging model (Bahga et al., 2016, VD et al., 2016), these connectors fit the cases when the consumer pulls messages from publishers, RabbitMQ and Amazon SQS are implementing messaging queues model (Bahga et al., 2016).

3.3.2. Analytics module

Nature of big data and business need for analyzing such data were motivators for the emergence of big data analytics trend (Venkatraman and Venkatraman, 2019). Sub-modules that perform batch and real-time analytics are parts of this module (Lipic et al., 2014,Bahga and Madisetti,2019,Ta-Shma et al., 2017).

3.3.2.1. Batch analytics

Provides high throughput when processing massive data, but with latency in performance could last for hours or days for completing one job (Ta-Shma et al., 2017). Meanwhile, real-time

processing is performed in applications where time matters and results required in (near) real-time of data production (Hurwitz et al., 2015). Map-reduce is an algorithm allows writing programs able to partition (map) massive data set among various processing units and process each individually (Stolpe, 2016, Ta-Shma et al.,2017, Merla and Liang,2017) then combine (reduce) results of each processing step into a single result (Lipic et al., 2014). Apache's Hadoop MapReduce and Amazon's Elastic MapReduce (EMR) are example batch processing engines that are implementing map-reduce algorithm (Ta-Shma et al., 2017) for batch processing, directed acyclic graph (DAG) is another algorithm used for batch processing implemented by Apache Spark (Bahga and Madisetti, 2019).

3.3.2.2. Real-time (stream) analytics

In contrast to batch analytics that has a start and end timings real-time analytics requires timely and continuous processing of data in motion (streaming data) (Hurwitz et al., 2013, Ta-Shma et al., 2014,Lipic et al., 2017). Processed streams are moved to memories in cluster nodes before transforming them to the disks (Hurwitz et al., 2013, Lipic et al., 2014). Apache Spark Streaming and Apache Storm are examples of real-time processing engines where the later is used in the case that need in-memory processing(Bahga and Madisetti, 2019).

Interactive querying engines are interacting with the analytics module, and have a user interface provided to facilitate querying a data set using queries of dedicated query languages (Lipic et al., 2014) like Apache Spark SQL and HiveQL of Apache Spark and Hive, respectively (Cho et al., 2014,Bahga and Madisetti,2019).

In general, all analytics operations are serving two categories of analysis; particularly direct analysis and exploratory analysis. Direct analysis answers predefined questions through analytics techniques. On the other hand, exploratory analytics is required when there is no predefined

question; in such cases, the analytics engine searches data to find exciting findings (Mani and Fei, 2017).

Data either flows from the analytics module to be visualized through the visualization module or may flow back to the analytics module for additional processing. Data collected from data sources are stored in the storage module and forwarded to the analytics module.

3.3.3. Storage module

Data collected from various data sources and analytics frameworks as a final or temporary analytics results are stored and administered by this module, waiting for additional processing or visualization. Data either stored in distributed file system (DFS)in the form of files with various file formats (Semlali et al., 2020), retrieved through MapReduce jobs or stored in noSQL databases and retrieved via query languages of underlying noSQL DBMSs (Lipic et al., 2014).

3.3.3.1. Distributed file system (DFS)

A file management system for parallel processing of data in multiple nodes, such file systems are assumed to allow scalability, ability to store files of typically – any size, and reliability so that data availability is not affected by a node failure (Mazumder and Dhar, 2018). Hadoop distributed file system (HDFS) is a widely used choice in today's big data implementations. Input and output of map and reduce functions are read and written on the top of HDFS. HDFS is Hadoop's implementation of DFS, other implementations of distributed file systems are IBM's GPFS-FPO, Intel's Lustre (Mazumder and Dhar, 2018). HDFS is managing file system in processing units of commodity servers (cluster) in data centers of the organization or those provided by technology giants in the form of the platform as a service (PaaS) (Venkatraman and Venkatraman, 2019), like in Amazon web services (AWS) cloud (AWS, 2020) and IBM's cloud.

3.3.3.2. Serving databases (stores)

Non-relational DBMSs are a key storage component in big data ecosystem (Jagadish et al., 2014) since they store data and analytics results for further tasks such as visualization (Bahga and Madisetti, 2019). NoSQL databases work as stores for interim and final analysis results (Ranjan, 2014).The main reasons for adopting noSQL databases are covered next.

1. **Distributed processing through horizontally scalable servers:** since the volume of social media data and big data in general is continually increasing; then relational databases are not the best choice since fulfilling scalability requirement in such databases is very expensive and complicated, in contrary with noSQL databases (Sareen and Kumar,2015,Shahraki et al., 2017).
2. **Not adhering to relational data model** databases with relational data model are designed to deal with structured data with relatively small volume often processed in one server, which is not suitable with dynamic data that overgrows. Moreover, majority of retrieval operations in relational databases includes join operations, which becomes problematic when the size of database increases and the number of joins grow (the so-called join pain) which takes considerable execution time (Zhang and Zhang, no date, Robinson et al., 2015).

It is apparent that noSQL databases cope with nature of big data and overcome shortcomings in the relational databases (Gupta et al., 2017,Bikakis, 2018) in terms of providing requirements of databases that are distributed on a cluster(s) such as availability, scalability and fault tolerance (Lipic et al., 2014,Bahga and Madisetti, 2019)and capability to handle semi-structured and unstructured data. It is worthy of mentioning that there is no standard query language for noSQL databases since query languages are data model dependent (Kaur and Rani,2013,Phiri and Kunda, 2017).

The well-known data models for noSQL databases are key-value, document, graph and column-oriented (Lipic et al., 2014) and will be covered in the next subsections.

1. **Key-Value databases** are storing data items in tables (Moniruzzaman and Hossain, 2013) of two columns. Each item in such databases is a combination of a unique alphanumeric key used for search operations, and the value contains data in the form of primitive data type or an object (Seeger, 2009,Bhuvan and Elayidom, 2015) (Figure 3.2). Key and value relationship is specified by the programming language used to create the object; this dispenses the need for strict data model (Seeger, 2009). Amazon's Dynamo and Riak are examples of key-value DBMSs (Bhuvan and Elayidom, 2015, Gupta et al., 2017) and Redis is an in-memory key-value DBMS (Zhang et al., 2015).

Key	Value
f911c336e5b89e	Content-Type: image/gif R0lGODlhKwI1AXcAMSH+GlNvZnR3YXJlOiBNaWZ AhsBgQAAAAAAAP8AAPhI+py+0Po5y0AiEM3pl1e

Figure 3.2: A snapshot from a key-value database - Source (Weber, no date)

2. **Document databases** are higher versions of key-value databases since they have the same data model with more complicated values (Gupta et al., 2017). In document databases, the key is an alphanumeric string that could represent a file path or a Uniform Resource Identifier (URI) (Venkatraman et al., 2016) and the value is a collection of semi-structured texts such as JavaScript Object Notation (JSON) and extensible markup language (XML), unstructured texts such as portable document format (PDF) and MSWord files documents in addition to Binary JSON (BSON) format which is used for storing images and videos and binary serializing JavaScript object notation (JSON) files, and improving processing performance (Venkatraman et al., 2016), Figure 3.3.

In contrast to key-value databases, data in document databases could be queried either through key or value (Moniruzzaman and Hossain, 2013,Bhuvan and Elayidom, 2015). MongoDB and CouchDB are examples of document DBMSs (Gupta et al., 2017) and MongoDB runs partially in-memory (Zhang et al., 2015).

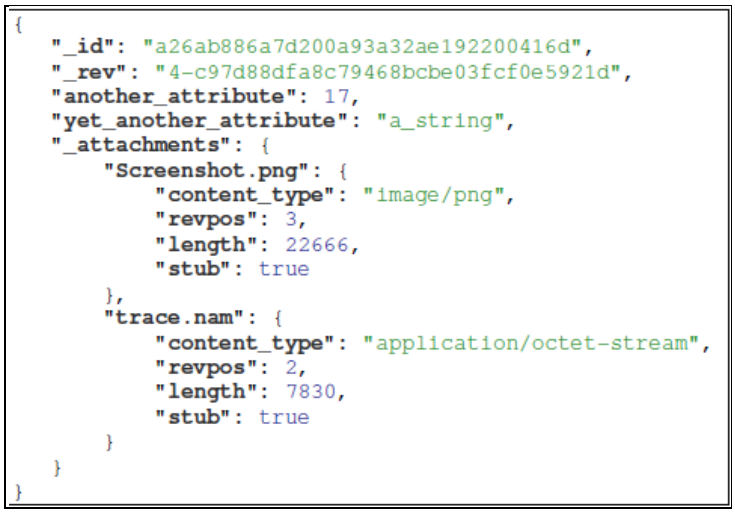


Figure 3.3: A snapshot from a document database contains a JSON document – Source (Weber, no date)

3. **Graph databases** have been used to model graph-like data structures (Angles and Gutierrez, 2018, Angles 2018) with highly interconnected data; therefore, it could be represented using graphs. Data in graph databases are modeled in a form of nodes and edges where nodes representing entities and directed edges representing relationships among them, both nodes and edges have descriptive attributes (Kaur K, Rani, 2013,Venkatraman et al., 2016), see figure 3.4.

   Although there are various mathematical graph models, property graphs are mean there. The property graph is a directed graph where both nodes and edges are labeled and can have any number of properties (attributes) and any number of edges between any two nodes. Properties are representing metadata of edges or nodes in the form of key-value pairs (Angles and

Gutierrez, 2018). Neo4j and Titan are examples of graph DBMSs (Gupta et al.,2017, Angles,2018) and Trinity and Bitsy are graph DBMSs running in-memory (Zhang et al., 2015).

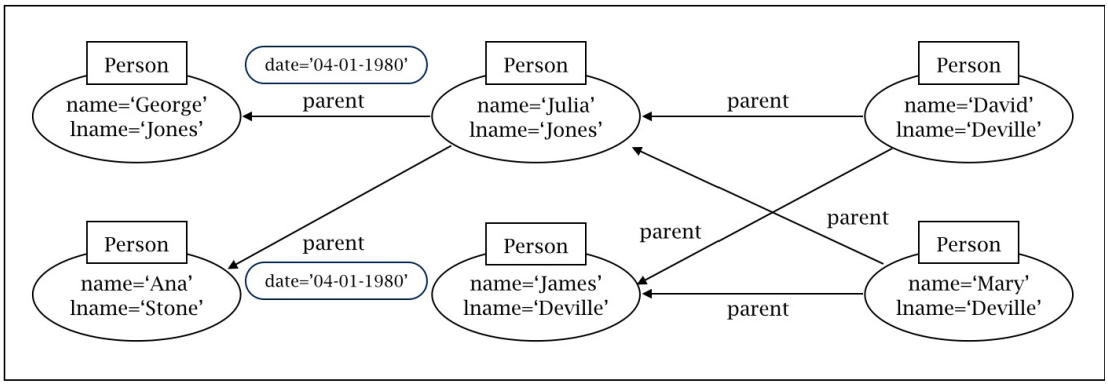


Figure 3.4: Property graph data model - Source (Angles, 2017)

4. **Column-oriented databases** are contrasts to relational databases, where columns are defined on the table level and are fixed for each row. Columns in this data model are defined in row-level as shown in figure 3.5, this allows having a various number of columns for various rows and adding columns whenever needed (Moniruzzaman and Hossain, 2013), this supports scalability when data is varied (Hurwitz et al., 2013), HBase, BigTable and Cassandra are example column oriented DBMSs (Bahga and Madisetti, 2019) where IM Column Store is running in-memory (Oracle, 2020).

Column Family: Students						
Key				Columns		
1	Name	DateOfBirth	IDCard	PlaceOfOrigin	Country	
	Jean Grey	19-05-1963	1234567	Austin	USA	
2	Name	DateOfBirth	IDCard	Supervisor		
	Scott Summers	12-10-1968	765414A	Name	DateOfBirth	IDCard
				Emma Frost	1-1-1936	222222

Column Family: Professors					
Key				Columns	
1	Name	DateOfBirth	IDCard	PlaceOfOrigin	Country
	Charles Xavier	13-07-1940	111111	Mirfield	UK
2	Name	DateOfBirth	IDCard		
	Emma Frost	1-1-1936	222222		

Figure 3.5: A snapshot from a wide-column database – Source: (Ribeiroet al., 2015)

Data may need additional processing and flow back to the analytics module, or it may flow to the presentation module to be processed and presented in human-readable formats.

3.4. Presentation module

Traditional visualization systems are not fulfilling requirements of big data visualization due to need for dynamic visualization(Agrawal et al., 2015,Bikakis, 2018) in some use cases and the nature of big data. The task of visualizing big data is challenging, to overcome challenges like performance latency and massive volume of data, techniques as parallel rendering, pre-fetching and caching relevant predicted data to speed up response time (Agrawal et al., 2015, Bikakis, 2018), in addition to use of filtering, sampling and aggregation techniques (such as clustering) to address issues of presenting massive data (Agrawal et al., 2015,Bikakis, 2018).

Presentation system is the front end of the big data ecosystem and adds value to decision-makers (Cho et al., 2014, Angles,2017,Caldarola and Rinaldi, 2018, Petrovska and Ajdari, 2019, Venkatraman and Venkatraman, 2019),it allows presenting (batch or real-time) analytics results for end-user in visual form (static or dynamic) (Hurwitz et al., 2013, Agrawal et al., 2015) this way analyst's eye could easily elicit meaningful information via relationships, trends and patterns (Petrovska and Ajdari, 2019).

Furthermore, as mentioned in section 3.3.2.2 presentation module could provide an interface for user interaction through querying data set to obtain analysis results via queries of dedicated query languages. Data set could be reprocessed for getting more accurate results (Cho et al., 2014).

Analytics results are visualized in regular reports or dashboards or graphical forms (Ta-Shma et al., 2017,Petrovska and Ajdari, 2019) that could be animated according to changes in data. Pygal

and Seaborn are example visualization Python libraries (Bahga and Madisetti, 2017, Caldarola and Rinaldi, 2019).

3.4. Social Media Analytics (SMA)

Technically, SMA is a specialization of big data analytics that is could be applied for evaluating the achievement of business objectives through social media, as discussed in Chapter II. SMA refers to analyzing user-generated content in social media platforms to achieve the business objective(s). Lusch et al. (2010) defined SMA as it "is concerned with developing and evaluating informatics tools and frameworks to collect, monitor, analyze, summarize, and visualize social media data, usually driven by specific requirements from a target application". Holsapple et al. (2014) introduced an SMA definition related to business intelligence; "Business social media analytics refers to all activities related to gathering relevant social media data, analyzing the gathered data, and disseminating findings as appropriate to support business activities such as intelligence gathering, insight generation, sense-making, problem recognition/opportunity detection, problem-solution/opportunity exploitation, and decision making undertaken in response to sensed business needs". Among other definitions reviewed by Misirlis and Vlachopoulou (2018), the one of Sterne and Scott (2010) have been adopted in this research as it defines SMA as "*a study of social media metrics that help drive business strategy".*

Social media metrics resulting from analytics should be linked to business performance metrics (Etlinger and Li, 2011) required for assessing goal achievement (Peters et al., 2013). In sum, social media metrics show how well social media serving business objectives and should be analyzed and visualized to decision-makers.

Social media data could be in a textual or multimedia format; each form of data is handled differently; therefore, it produces a different set of metrics. SMA has three primary mechanisms:

content analysis, network/group analysis and prediction analysis (Gastelum and Whattam, 2013) will be covered in the next subsections. Intuitively, not all types of analysis are necessarily performed since analytics is performed based on application requirements.

3.4.1. Content analysis

Multimedia and textual data are subject to content analysis which identifies characteristics of content (Stemler, 2001) in the underlying context (Kataria, 2017). Content analysis for social media data aims to:1) analyze sentiments and identify users' opinions towards a specific topic, 2) categorize topics or identify trendy ones. Therefore, decision-makers in university as an example business could recognize students' attitudes towards topics like temporary conversion to online learning, through analyzing UGC on its SMBP as an example application of sentiment analysis.

Content analysis is generally defined as any process aiming to systematically and objectively identify specific characteristics of content (Stemler, 2001).Although the definition embraces analyzing textual and multimedia content, this work is limited on textual content analysis; therefore, discussion about sentiment analysis and topic identification in the next subsections is considering textual content.

3.4.1.1. Sentiment analysis

From social media perspective sentiment analysis aim to identify orientation(negative neural or positive) of a conversation regarding a specific post, posts history or discussion in a chat room; it depends on natural language processing (NLP) techniques that employ dictionaries and combinations of words. New researches aim to improve the accuracy of analysis by distinguishing human emotions, too (Gastelum and Whattam, 2013). Sentiment analysis is used too for predicting real-world events such as movie revenues, outcomes of shows such as Dancing with Stars and American Idol (Kapow, 2010), the activity of financial markets, etc.

3.4.1.2. Topic identification

Topic identification in the contexts of social media aims to classify topics of public postings in social media in general or classifying topics related to a specific object (a brand, a celebrity, an organization or any keywords) which allow tracking and visualizing audience trends (Gastelum and Whattam, 2013). In addition to analyzing topics of conversations in social media, researchers found ways to analyze topics of documents and topics in the contents of documents uploaded in social media.

3.4.2. Network and community (group) analysis

Social network analysis infers characteristics of nodes in social networks and relationships among them. Social network analysis eventually aims to detect communities, identify common characteristics of users in a community and determine user's characteristics (Gastelum and Whattam, 2013). Typical uses of social network analysis in the business context are: identifying key influencers among customers and segmenting audience for targeting them (Kataria, 2017).

Various objects (people, tweets, posts, etc.) in social media platforms are representing vertices of a graph connected via directed or undirected edges; these edges are representing either explicitly declared relationships (represented via real edges in the graph) such as adding a connection in LinkedIn, following a user in Instagram, Facebook or Twitter or implicit relationships inferred from user's activity such as liking a video in YouTube, sharing a post in Facebook or Twitter (Bonchi et al., 2011). Social network analysis can fall into one of three categories (Gastelum and Whattam, 2013) covered next.

3.4.2.1. Community detection

Communities in social media are formed based on social relationships such as friendship, professional associations, information flow or similar interests (Lim et al., 2013) towards a

product, topic of interest, an author or any issue. Community detection aims to reveal centers of communities in the network, community intent, aspects of similarity and differences among groups, new or emerging groups (Gastelum and Whattam, 2013). Theoretically, the social network could be splitted into clusters representing communities based on the density of links between graph vertices; in other words, dense clusters are representing communities (Lim et al., 2013). Identifying key influencers within the group may come as an additional analysis step after identifying the group itself (Gastelum and Whattam, 2013).

Identifying key influencers relies on measures like 1) *degree centrality* which gives a score to each vertex based on a number of links held by it, therefore, it allows finding popular people and those who are connected to a lot of information, 2) *betweenness centrality* which counts how many times the vertex resides in the shortest path between other groups, therefore, it allows identifying people who are affecting the flow of information; who often reside in the conjunction of two clusters, 3) *closeness centrality* which gives scores to every node in the graph based on its closeness to all other vertices, this measure is used to identify vertices that could be used for spreading information over the network more quickly because of their position, 4) *eigen-centrality* which used to assess vertex influence by assessing vertex's degree centrality, then the degree of centrality of vertices linked to it and so forth, 5) *page rank* which is used to evaluate citation and authority since it considers-in addition to eigen-centrality- edge direction and weight (Disney, 2014).

3.4.2.2. User characteristics

This type of analysis determines characteristics of social media users -or group individuals- such as demographic, political belonging and geo-location, from their profiles, to use them for further

analysis tasks such as predicting user's behaviour (Tuna et al., 2016, Lyu et al., 2020) or whether the user is a human or a bot (Tuna et al.,2016).

Although not all data in social media is tagged with location, researchers are developing methods to extract location from non-geo-referenced text based on geo statistics and NLP techniques (Gastelum and Whattam, 2013).

3.5. Web Analytics

Web analytics is defined by Web Analytics Association (2008) as "the measurement, collection, analysis and reporting of internet data for the purposes of understanding and optimizing web usage".

Web analytics tools are indispensable for evaluating the value gained from social media (Elinger and Li, 2011, Lee, 2018). Besides SMA, which was discussed in the previous section, web analytics plays a vital role in measuring the performance of a web site or web page. Commonly used metrics of web analytics will be discussed in the following subsections.

3.5.1. Visitor and visit metrics

These metrics are describing attributes of visitors during a website visit, such as repeated users, new users, visits per visitor, visit duration, traffic source (referrer) and how many times a visitor clicks a link (click through) etc. (Web Analytics Association, 2008).

3.5.2. Behaviour (engagement) metrics

Behaviour metrics are metrics describing visitor's behaviour during a website visit such as his\ her single-page visits (bonuses) and page views per visit. These metrics are indicators of engagement or interaction with the web site (Web Analytics Association, 2008).

3.5.3. Conversions metrics

Conversion is a completely achieved business goal such as buying a product, sharing content, watching a video, completing a form, downloading a file and others. Conversion metrics are describing a specific activity on the web site that achieves a conversion (Web Analytics Association, 2008). Conversions are classified into macro and micro; usually, the macro conversion is a completed money deposit transaction meanwhile micro conversion is a conversion that leads to a macro conversion such as filling a signup form, viewing a specific page, downloading product procure to name a few (Google a, 2020). Herein, the researcher has provided an example of specifying goals in Google analytics as an ideal tool of web analytics tools.

Assuming that the objective of the sales unit is to close a deal, after a successful purchase the customer is directed to "Thanks for Buying" page which represents the goal or conversion. Desired conversion(s) could be identified, defined and tracked through setting goals in Google Analytics (Google b, 2020) by setting the URL of the destination web page (in this case "Thanks for Buying" that appear after pressing payment confirmation button), and the step pages that lead to this page, and expected monetary value of reaching this page as goals.

3.6. Summary

This chapter was focusing on one of the research fields; the big data and SMA as a subfield of big data. Big data ecosystem has been investigated; used technologies were identified and grouped into modules sharing the same broad objective. Since the whole system is heterogeneous and modules themselves are heterogeneous in terms of used technologies; the modules of the system were dissected to illuminate data flow among system modules and used technologies and

example software solutions in the market. Next, social media analytics and its applications will be covered in addition to web analytics.

CHAPTER IV

Research Design and Methodology

4.1. Introduction

This chapter involves four main sections; the first one is introducing the followed research design, the other sections are covering research methodology in terms of stakeholders' analysis, selected sample and results; then findings from results will be discussed for the sake of developing the solution framework in the next chapter.

4.2. Research Design

At the very beginning, the research was intended to be an action research, so that the researcher should included in solving the problem of the shallow understanding of social media effect on business performance and therefore resistance of social media adoption through performing a longitudinal analysis on business performance before and after adhering the solution social media adoption framework. When the work goes in-depth, namely at the stage of data collection; targeted businesses was not cooperative and eventually refused to disclose data related to underlying business performance perspectives. Therefore, the action taking the phase –which is a vital stage in action research as stated by Susman and Evered (1978), had been missed so that the research tends to be more exploratory in its nature. Action research will be discussed in the next paragraphs.

Coughlan and Coghlan (2002) defined action research as a research method that is aiming to take action to solve a problem and contributing to knowledge and theory about that action. Blum (1995) summarized action research in a couple of stages; one for diagnosing a social problem and another one for having a view for solving the problem. Rapport (1970) as cited by Susman and Evered (1978) characterized action research by its contribution to "practical concerns of people in an immediate problematic situation" and achieving scientific goals through collaboration within a mutually agreed ethical framework.

Susman and Evered (1978) defined action research as a five staged circular process that involves diagnosis, action planning, action taking, evaluating and specifying learning. The authors have assumed that stages of collaboration between a researcher in action research, and practitioners may differ from one project to another. This definition was adopted by the researcher since the stages that the study followed was –almost- identical to stages specified in the definition.

Use of social media in the business context is relatively new; therefore, there is a lack of researches that elucidates organizational use of social media and gaining benefits from such use; this research is exploratory since it overlaps with social sciences such as business and communications and serves investigation of a newly emerging topic (Cooper and Schindler, 2014). The research milestones are depicted in figure 4.1.

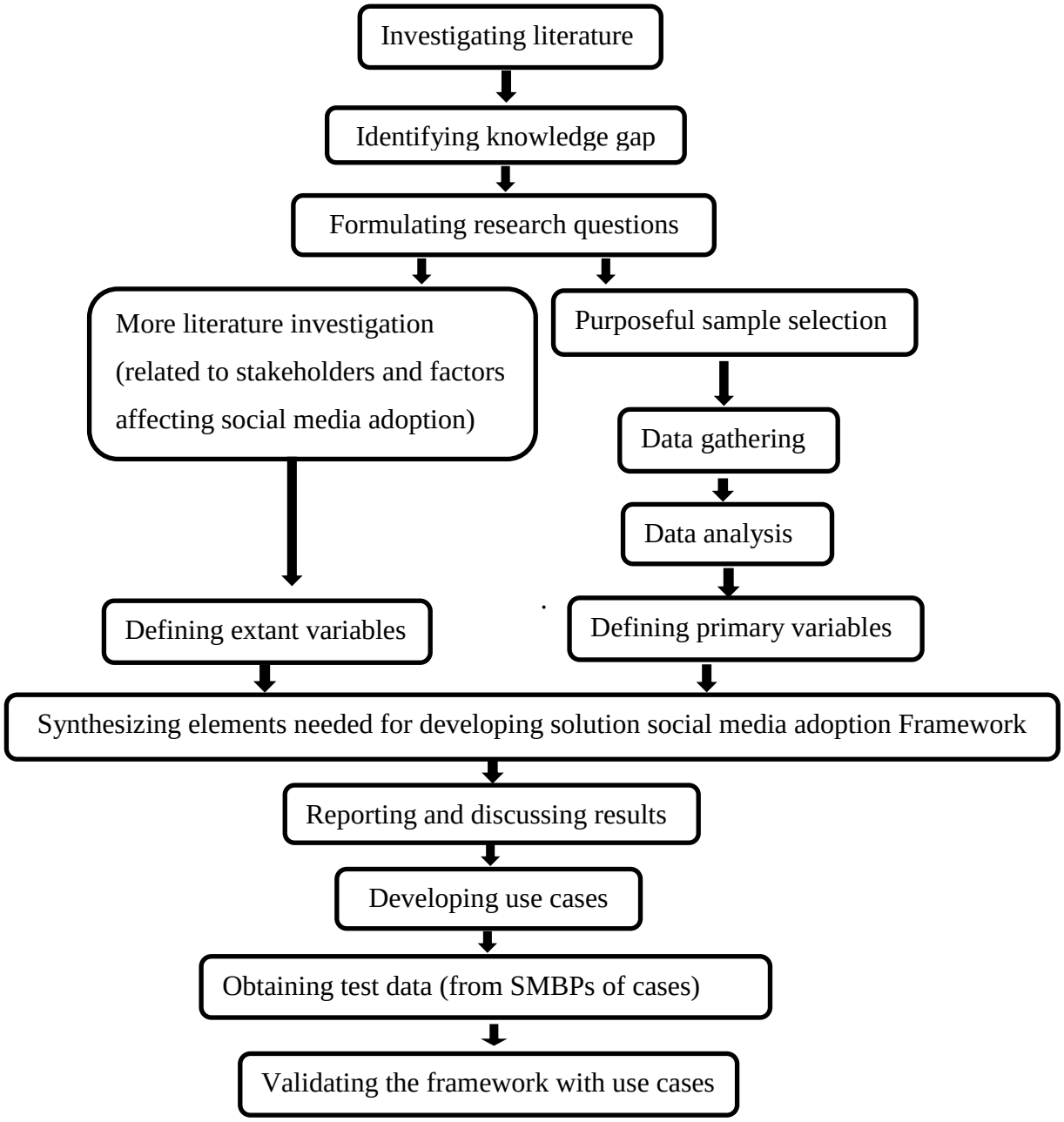


Figure 4.1 Research stages

4.3. Stakeholders Analysis

Based on observing social media ecosystem within businesses and analyzing data, key stakeholders are: *management* which involves unit directors in addition to top management, *internal and external audience* and *social media specialists (team) or a third party* and *a legal consultant*.

The audience ofsocial media business profiles (SMBPs) has to be considered in terms of identifying targeted audience group, preparing content fits audience needs, analyzing user generated content (UGC) in a way gives useful insights to the business and formulating policies for social media use by the internal audience. Furthermore, the audience in social blocks related to business web site has to be monitored since they may mention the business in a way that harms its reputation. The social media team is collaborating with units' directors to map business objectives into social media objectives, agree upon concept behind the content of SMBP, and building a community around it (Safko and Brake, 2008), identifying human, hardware and software resources needed for social media adoption process with the help of IT personnel.

Social media team joins representatives from related business units who are conveying messages that are intended to be conveyed over SMBP. Once business objectives are identified, they should be reflected for the social media team to post relevant content, apply relevant analytics to generate insightful reports.

Management needs to consult a legal counsel to formulate an updated social media policy that conforms to national labour regulations. Schmidt and O'Connor (2015) in their study for drafting social media policy recommended referring to federal labour regulations and being specific regarding acceptable and non-acceptable behaviour in social media. However, social media formulation takes time to be finished and delivered as a part of the employee's handbook; since new cases are expected to emerge during the use of such new technologies.

4.4. Requirements Gathering

To relate the state of the art of social media adoption frameworks with the situation in Sudan, via reflecting professionals opinions about social media and current status of social media use in organizations working in Khartoum; the researcher submitted500 copies of the questionnaire

only 121 correspondents responded, the sample involved 29 managers and 91 non-manager staff from various industries such as oil and energy, higher education, service ministry, non-governmental organization (NGO), telecommunications and banking and finance. Then the researcher conducts a cross-sectional analysis on data. Further, different ownership types and sizes of businesses had been represented by the sample to make the questionnaire more purposeful (table 4.1).

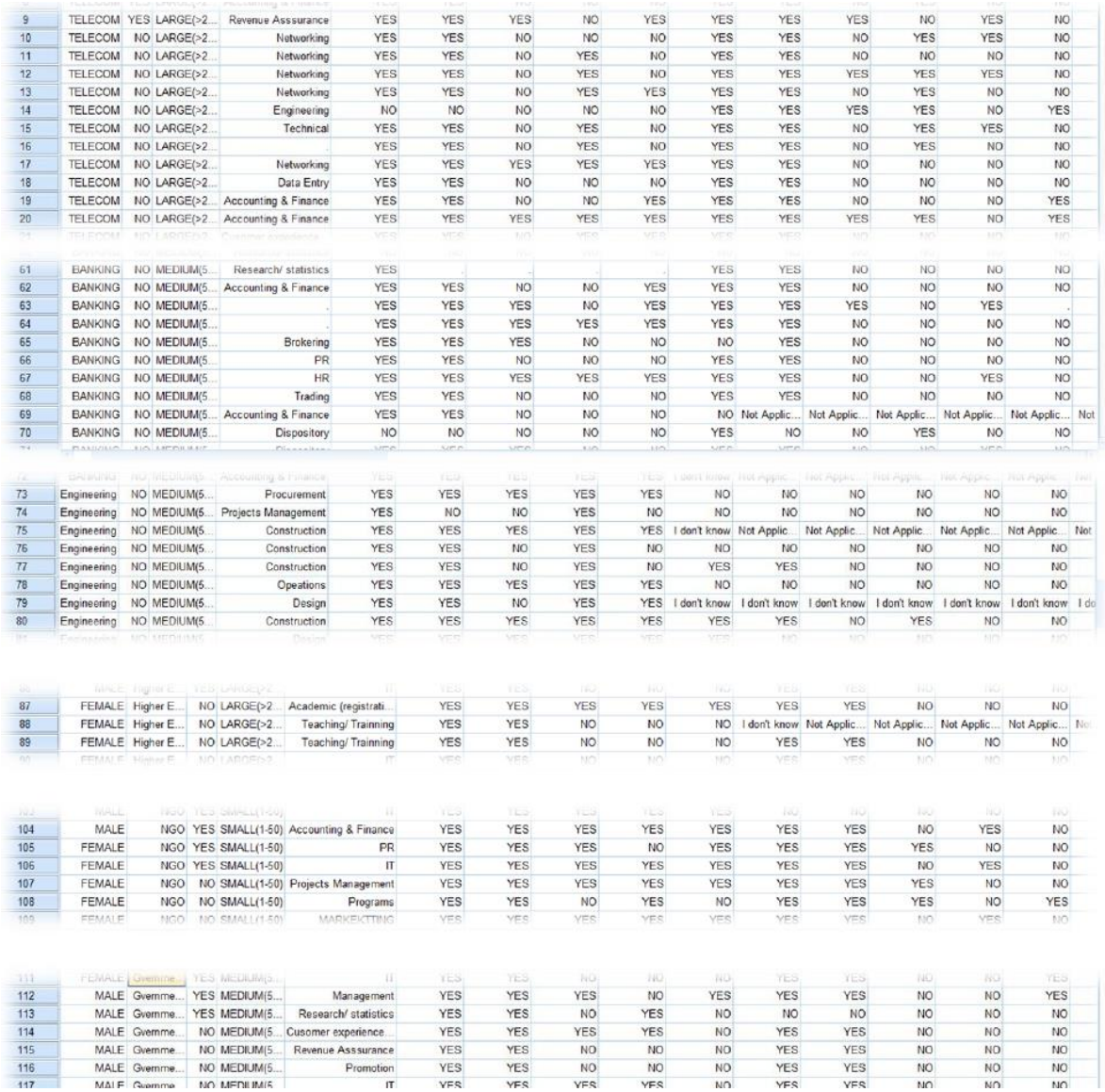
Table 4.1A list of surveyed businesses

	Industry	**Name**	**Number of cases**
1	Banking and finance	Khartoum Stock Market	25
2	Engineering	DAL Engineering Co. Ltd.	9
3	Oil and energy	SUDAPET	13
4	Telecommunication	MTN	34
5	Higher education	Sudan University of Science and Technology.	18
6	Service Ministry	Ministry of Investment	12
7	NGO	AppNet Technology (working under the umbrella of an NGO)	10
Total			121

Generally, the questionnaire (appendices A.1 and A.2) aims to reveal employees' awareness, opinions and attitude towards social media use in their organizations and its relationship with business performance and the role of social media in raising this performance.

The questionnaire distributed in Khartoum in the period during 8th May 2018 till 5th July 2018. The main points of the questionnaire were 1) employee's ownership of personal social media

accounts, 2) employee's knowledge about the business presence in social media, 3) employee's knowledge about social media platforms adopted by the employer, 4) frequency of employee's interaction with organization's SMBPs, 5) employee's assessment of business engagement in social media, 6) employee's knowledge about the value gained from business presence in social media, 7) employee's knowledge about targeted objectives that should be reached by his/ her business unit, 8) employee's knowledge about social media metrics of their employer's SMBP, and lastly, 9) performance indicators that have a potential of improvement –when social media adopted- according to the employee.



9	TELECOM	YES	LARGE(>2...	Revenue Asssurance	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES	NO
10	TELECOM	NO	LARGE(>2...	Networking	YES	YES	NO	NO	NO	YES	YES	NO	YES	YES	NO
11	TELECOM	NO	LARGE(>2...	Networking	YES	YES	NO	YES	NO	YES	YES	NO	NO	NO	NO
12	TELECOM	NO	LARGE(>2...	Networking	YES	YES	NO	YES	NO	YES	YES	YES	YES	YES	NO
13	TELECOM	NO	LARGE(>2...	Networking	YES	YES	NO	YES	YES	YES	YES	NO	YES	NO	NO
14	TELECOM	NO	LARGE(>2...	Engineering	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO	YES
15	TELECOM	NO	LARGE(>2...	Technical	YES	YES	NO	YES	NO	YES	YES	NO	YES	YES	NO
16	TELECOM	NO	LARGE(>2...	.	YES	YES	NO	YES	NO	YES	YES	NO	YES	NO	NO
17	TELECOM	NO	LARGE(>2...	Networking	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
18	TELECOM	NO	LARGE(>2...	Data Entry	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO	NO
19	TELECOM	NO	LARGE(>2...	Accounting & Finance	YES	YES	NO	NO	YES	YES	YES	NO	NO	NO	YES
20	TELECOM	NO	LARGE(>2...	Accounting & Finance	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
61	BANKING	NO	MEDIUM(5...	Research/ statistics	YES	.	.	.	.	YES	YES	NO	NO	NO	NO
62	BANKING	NO	MEDIUM(5...	Accounting & Finance	YES	YES	NO	NO	YES	YES	YES	NO	NO	NO	NO
63	BANKING	NO	MEDIUM(5...	.	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES	.
64	BANKING	NO	MEDIUM(5...	.	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
65	BANKING	NO	MEDIUM(5...	Brokering	YES	YES	YES	NO	NO	NO	YES	NO	NO	NO	NO
66	BANKING	NO	MEDIUM(5...	PR	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO	NO
67	BANKING	NO	MEDIUM(5...	HR	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	NO
68	BANKING	NO	MEDIUM(5...	Trading	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO	NO
69	BANKING	NO	MEDIUM(5...	Accounting & Finance	YES	YES	NO	NO	NO	NO	Not Applic...	Not Applic...	Not Applic...	Not Applic...	Not Applic...	Not
70	BANKING	NO	MEDIUM(5...	Dispository	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO
73	Engineering	NO	MEDIUM(5...	Procurement	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO
74	Engineering	NO	MEDIUM(5...	Projects Management	YES	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO
75	Engineering	NO	MEDIUM(5...	Construction	YES	YES	YES	YES	YES	I don't know	Not Applic...	Not Applic...	Not Applic...	Not Applic...	Not Applic...	Not
76	Engineering	NO	MEDIUM(5...	Construction	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	NO
77	Engineering	NO	MEDIUM(5...	Construction	YES	YES	NO	YES	NO	YES	YES	NO	NO	NO	NO
78	Engineering	NO	MEDIUM(5...	Opeations	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO
79	Engineering	NO	MEDIUM(5...	Design	YES	YES	NO	YES	YES	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know	I do
80	Engineering	NO	MEDIUM(5...	Construction	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO
87	FEMALE	Higher E...	NO	LARGE(>2...	Academic (registrati...	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO
88	FEMALE	Higher E...	NO	LARGE(>2...	Teaching/ Trainning	YES	YES	NO	NO	NO	I don't know	Not Applic...	Not Applic...	Not Applic...	Not Applic...	No
89	FEMALE	Higher E...	NO	LARGE(>2...	Teaching/ Trainning	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO
104	MALE	NGO	YES	SMALL(1-50)	Accounting & Finance	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO
105	FEMALE	NGO	YES	SMALL(1-50)	PR	YES	YES	YES	NO	YES	YES	YES	YES	NO	NO
106	FEMALE	NGO	YES	SMALL(1-50)	IT	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO
107	FEMALE	NGO	NO	SMALL(1-50)	Projects Management	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
108	FEMALE	NGO	NO	SMALL(1-50)	Programs	YES	YES	NO	YES	NO	YES	YES	YES	NO	YES
112	MALE	Gvernme...	YES	MEDIUM(5...	Management	YES	YES	YES	NO	YES	YES	YES	NO	NO	YES
113	MALE	Gvernme...	YES	MEDIUM(5...	Research/ statistics	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO
114	MALE	Gvernme...	NO	MEDIUM(5...	Cusomer experience...	YES	YES	YES	YES	NO	YES	YES	NO	NO	NO
115	MALE	Gvernme...	NO	MEDIUM(5...	Revenue Asssurance	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO
116	MALE	Gvernme...	NO	MEDIUM(5...	Promotion	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO

Figure 4.2 A snapshot of primary data

Fundamental analysis of the questionnaire was performed using statistical package for social sciences (SPSS) v24; a snapshot of primary data is depicted by figure 4.2and the code book that shows more details about questionnaire variables is in Appendix D. the findings from the survey were published by Hamid (2020) and will be discussed in the next sections.

4.5. Results of analyzing primary data

Only 71% (5 out of 7)of surveyed businesses were having SMBP(s), and the majority of respondents (79.6%) knew that their employers are having SMBPs. Consequently, the analysis of variables related to extant SMBPs was only including businesses that have SMBPs.

Table 4.2 presents employees evaluation of their experience with their employer's SMBPs, table 4.3 is an extension of "awareness about the existence of SMBPs" aspect in table 4.2, and it shows employee's awareness about social media platforms that are hosting their SMBPs. Table 4.4 shows the extent of employees' non-awareness about performance metrics of their business units.

Table 4.2 Employees perceiving of SMBP – Source (Hamid, 2020)

Issue	Variable	Frequency	Valid %
Not all employees know about the existence of SMBP	Awareness about the existence of SMBP	78	79.6
No value-added to the department by social media	Current SMBP adds value to the department	43	44.8
Unacceptable engagement level with SMBPs audience	SMBP is well engaged with customers	48	49.5
	Time frames (once ore more daily) of employee's interaction with SMBPs	15	15.3
Performance of SMBP is not announced to employees	Employees awareness regarding social media performance	32	32.7

Table 4.3 Employees knowledge about used platforms– Source (Hamid, 2020)

Platform	Knowledge about the existence of SMBPs	Percentage per business type			
		Telecommunication	Banking & finance	Higher education	Service ministry
Facebook	Based on Correspondents	39.0	50.0	78.9	75.0
	Real situation	Yes	Yes	Yes	Yes
Twitter	Based on correspondents	16.9	10.0	10.5	0.0
	Real situation	Yes	Yes	Yes	Yes
LinkedIn	Based on correspondents	20.8	12.5	0.0	0.0
	Real situation	Yes	No	No	No
YouTube	Based on correspondents	11.7	17.5	10.5	25.0
	Real situation	Yes	No	Yes	Yes
Instagram	Based on correspondents	7.8	5.0	0.0	0.0
	Real situation	Yes	No	No	No
An internal social media platform		3.9	5.0	0.0	0.0

Statistics of the engineering firm is excluded since there were a lot of missing values in responses to this question, NGO and oil and energy are also excluded since they don't have SMBPs.

Table 4.4 Employees with no idea about performance metrics of their departments – Source (Hamid, 2020)

Business type	Frequency	Valid percent
Telecommunications	10	29.4
Banking & finance	8	32
Higher education	9	50
Service ministry	1	9.1
Engineering	6	66.7
Oil and energy	8	61.5
NGO	1	10

Furthermore, table 4.5 shows business areas that have more potential to benefit from the social media adoption, table 4.6 shows employees from different industries were expecting the added value to the business as a result of proper use of social media in the business context.

Table 4.5Areas that have the potential for improvement if social media properly adopted – Source (Hamid, 2020)

Areas that have the potential for improvement with proper use of social media	Frequency	Valid percent
Customers' relationships such as keeping them satisfied, preserving them and expanding customers' base	65	25.6
The innovation which includes products/ services development and innovating new products/ services	50	19.7
Operational performance such as production rates and safety	28	11
Employee's relationships such as keeping them satisfied and attracting qualified employees	39	15.4

Areas that have the potential for improvement with proper use of social media	Frequency	Valid percent
Product/ service quality such as error rates and incentives for quality	28	11
Alliancing with other organizations which includes co-production, products design or collaborated projects	25	9.8
Presenting and discussing short term financial results such as annual profits, returns from assets and decreasing cost.	19	7.5

Table 4.6 Optimism regarding value-added from the proper use of social media - Source (Hamid, 2020)

Business type	Frequency	Valid percent
Telecommunication	24	70.6
Banking and finance	9	69.2
Higher Education	17	94.4
Service ministry	12	66.7
Engineering	15	68.2
Oil and energy	9	69.2
NGO	7	70.0

Table 4.7 reveals mostly used social media platforms among the Sudanese population who are represented in this case by employees of surveyed businesses.

Table 4.7 Mostly used social media platforms among local population– Source (Hamid,2020)

Platform	Having a personal account	
	Frequency	Percent of cases
Facebook	105	96.3
Twitter	40	36.7
LinkedIn	49	45.0
Instagram	41	37.6

Table 4.8 relates managers believe in value-added from the use of social media with receiving performance reports (graphically represented by figure 4.3).

Table 4.8 Believing in value gain from the use of social media versus receiving performance reports - Source (Hamid, 2020)

Managers believing that SMBP adds value to the department		VS	Managers receiving SMBP's performance reports	
Frequency	Valid percent		Frequency	Valid percent
15	53.6		12	41.4

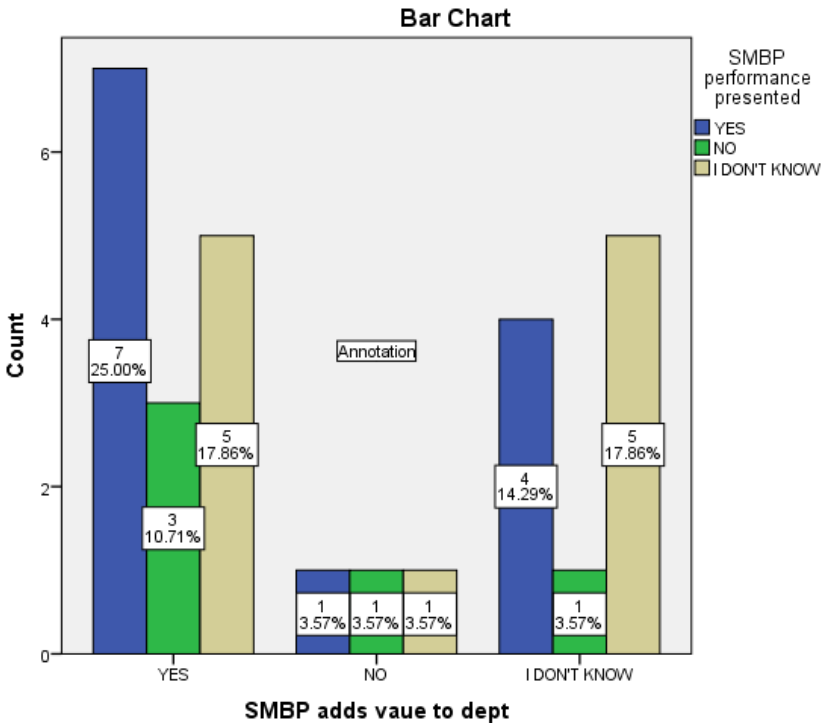


Figure 4.3Relating knowledge about SMBPs' performance with perceive of adding value from the use of social media - Source (Hamid, 2020)

4.6. Findings and Discussion

Results of primary data analysis are presented in the previous section; the results uncovered a number of points, and will be discussed in the next sub-sections.

1.A considerable sector of employees were not aware of the existence of SMBPs

"Not all employees know about the existence of SMBP", a large sector of employees were not aware of social media platforms adopted by their business and in few cases, they have supposed that SMBP is hosted in a platform where it was not existing (table 4.2, table 4.3).

2.Employees were not satisfied with SMBPs owned by their employers

Approximately,40% of employees have the believe that "currently, no value-added to departments by social media" and employees concerned with social media activities have shown "unacceptable engagement level with SMBPs". Furthermore, it is evident that a

considerable portion of employees is not aware of the performance of SMBPs and performance metrics that were used to evaluate the achievement of the objectives at their departments (tables4.2 and 4.4).

3.Expectations from the systematic adoption of social media tend are high

Further data analysis shows that employees believed that social media has a high potential of success if it was used systematically in the business context; in addition, they were expecting that social media will be more successful with particular business units such as customer relationship management (CRM), innovation and enhancing employee's relationships than others (table 4.6 and table 4.5) consequently.

4.SMBPs should be in mostly used platforms in the country

Table 4.7 ordered mostly used social media platforms among Sudanese, who were represented by surveyed employees. It is apparent that Facebook followed by Twitter, then LinkedIn are dominant platforms in terms of having active personal accounts; this result is aligned to international statistics that had been presented at Chapter II. This implies paying attention to those platforms and making a presence on them.

5.Reporting performance of SMBPs is related to perceiving value-added from them

Analysis results in table 4.8 shows that managers who were perceiving the value added to their departments from SMBPs were 53.6%and 41.4% of all managers were also receiving performance metrics of SMBPs (table 4.8).Correlation between sensing of added value by SMBPs and reporting its performance is displayed in the cross-tabulation at figure 4.2.

However, the rest portion (%57) of managers who was reported about SMBPs performance was not aware of whether there was an added value to their units or not; this result is not

surprising since it reflects failure of the business in relating SMBPs performance with departmental performance.

Analysis of survey variables (primary data) revealed that some activities are indispensable in the journey of social media adoption; activities are shown in table 4.9.

Table 4.9 Variables derived from primary data – Source (Hamid,2020)

Variable\ construct	**Description (activities should be undertaken)**	**Source(s)**
Mostly used social media platforms among the business audience	1. Launching SMBP(s) in platforms where the audience are active. 2. Probing whether social media has the potential of success regarding industry and\ or business unit. 3. Identifying and paying social media effort for business units that will be affected by and could be tracked from social media.	Table 4.7
Areas that have the potential for improvement if social media systematically used		Table 4.5
Awareness of having SMBPs by employer	1. Using traditional and online media to introduce SMBP(s) to social media actors (internal\ external) 2. Linking SMBP(s) with the business website	Table 4.2 %79.6
Employees knowledge about platforms hosting SMBPs		Table 4.3 Range%7.8 – %78.6
SMBP(s) is not well engaged with customers	1. Clearly define employees who will manage SMBP(s) and their responsibilities in social media policy and assess social media performance continuously	Table 4.2 %49.5
Time frames\ (engagement with) of		Table 4.2 %15.3

Variable\ construct	Description (activities should be undertaken)	Source(s)
employees interaction with SMBPs.	2. Accepted and non-accepted behaviour in SMBPs should be stated in social media policy 3. Content publishing should be scheduled on times with the highest access rates.	
Employees did not always know the performance metrics of business units of these units	1. Identified performance indicators should be for business units that may be affected and tracked through social media,and communicated to whom may concern. Then the right web and social media metrics should be selected 2. Requirements analysis should be considered when selecting social media analytics (SMA) software, and analysis results should be reported.	Table 4.4 range (10.0–66.7)
Employees awareness regarding social media performance		Table 4.2 %32.7
Reporting performance of SMBP(s) is not always assuring perceiving value-added from their use	To gain management support; the impact of social media on business performance should be demonstrable, in other words, social media performance should be linked to business performance	Figure 4.1

Moreover, examined literature, resulted inanother set of variables shown in table 4.10, will be denoted as extant variables.

Table 4.10 Variables adopted from literature

Variable\ construct	Source(s)
Social media adoption is succeeding with some businesses, failing with others and taking more time to grow with others	(Werder et al., 2014, Lacka and Chong , 2016)
Publishing high-quality content stimulates audience engagement	(Dowson,2009, Maroon, 2018,Kanuri et al, 2018,Hofmann, 2019)
Monitoring UGC related to business.	(Dowson, 2009)
Knowing more about the audience, competitors and their audience	(Safko and Brake, 2008)
Lack of awareness about the presence of the organization in social media inhibits audience engagement	(Hofmann, 2019)
Exploring prospected social media platforms for better understanding	(Dowson,2009,Duane and O'Reilly, 2016,El-Din et al., 2017)
Aligning social media objectives with identified business objectives	(Werder et al., 2014, Duane and O'Reilly, 2016, El-Din et al., 2017)
Messages should be tailored to fulfill targeted audience group	(Dowson, 2009, Hofmann, 2019)
Evaluating employees engagement with SMBPs using right key performance indicators (KPIs)	(Alberghini et al., 2014)
Avoiding the implications of social media misuse	(Effing and Spil, 2016)

1. Identifying social media team members (internal actors) 2. Human resources (HR) is responsible for assigning the tasks of designing, implementing social media strategy and budgeting needs of social media adoption to the social media team	(Werder et al.,2014, Duane and O'Reilly,2016,Sharma and Bhantagar, 2016, El-Din et al., 2017)
Announcing adopted social media platforms	(El-Din et al, 2017, Kanuri et al, 2018)
Factors affecting the selection of social media platform	(El-Din et al., 2017)

Derived and extant variables in tables 4.9 and 4.9 are adopted in the solution framework and will be discussed thoroughly in the next section. It is worthy of mentioning that the developed framework is an enhancement for previous social media adoption frameworks. Frameworks by (Dowson,2009, Kooi, no date, Werder et al., 2014, Duane and O'Reilly, 2016, El-Din et al., 2017) had significantly contributed in establishing pillars for social media adoption in the business context. Furthermore, stakeholders' requirements and factors affecting adoption process are accompanied in the development process.

4.7. Summary

This chapter was discussing the methodology followed in this work; starting from stakeholders' analysis, going through elaborating data collection tool and population sample, drawing findings from data analysis, and eventually developing social media adoption framework based on

outputs of aforementioned outputs and considering factors that are affecting the adoption process. Some of the solution framework components will be validated in the next chapter.

CHAPTER V

Solution Social Media Adoption Framework and Validation

5.1. Introduction

This chapter has two main sections, elaborating validation of a number of elements of the solution framework namely; objectives identification, resource identification, capacity building in addition to experiment and exploration using two use(test) cases (Zave, 2016).

The framework elements are validated against two use cases, namely: brand awareness and competitive advantage, which are performance indicators related to marketing and public relations units, respectively. Work in the main sections of this chapter is taken from a published paper by the Hamid (2020).

5.2. The Solution Framework

Determining whether social media is fitting business or not, is a prerequisite for taking the decision of going through adoption road or quitting. The solution social media adoption framework has four stages, where each stage consists of tasks involves setting specifications. The decision of investing in social media or not is based on whether adoption has a potentiality of success with business or not, and the decision is the output of experiment and exploration

stage because it reveals the amount of UGC, since if there was no data then there will be nothing for analysis. Figure 5.1 visualizes the solution framework; meanwhile, table 5.1 is summarizing the framework elements in a tabular format, then the steps will be discussed.

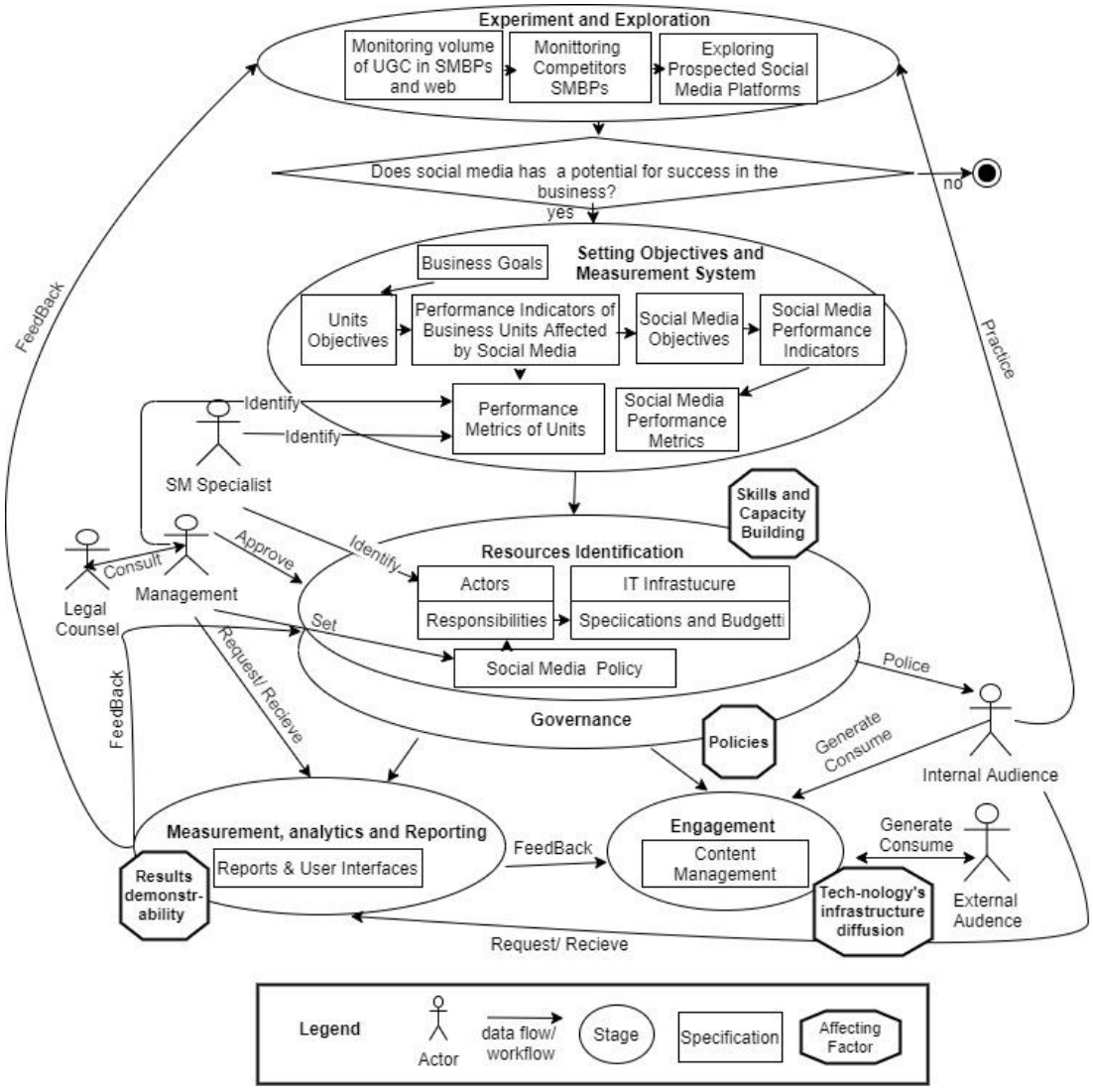


Figure 5.1An abstract view of the solution social media adoption framework and stakeholders – Source (Hamid, 2020)

Table 5.1Description of social media adoption framework stages

Stage	A brief description	Stakeholders
Experiment and exploration	1. Checking whether the volume of UGC in SMBP(s) deserves analysis and investing in social media adoption or not then investigating competitors SMBPs or taking the initiative of having SMBP(s) if no one took it before and doing the same check again. 2. Then, the individually informal learning process of prospected social media platforms takes place inside business.	Internal audience
Setting objectives and measurement system	Identifying business performance perspectives that could be supported through the use of social media and therefore, performance metrics of corresponding social media performance indicators.	1. Management 2. Social media specialists
Resources identification and assignment	Actors from the business who are participating in each activity related to SMBPs should be identified and informed regarding their responsibilities, and then social media specialists should identify specifications of hardware, software and training needed to accomplish publishing and analyzing content on SMBPs then expenses should be prepared for approval by management for budgeting.	1. Management 2. Social media specialists
Governance	Social media policy is formulated in order to police the use of social media inside business, guideline content publishing guidelines and define procedures that should be followed to mitigate reputation risks resulting from the use of social	1. Internal audience 2. External audience 3. Legal counsel

	media.	
Engagement	SMBP(s) launched, high-quality content aligned with business objectives is published, and a community of customers and prospects is built at this stage.	1. Management 2. Social media specialists 3. Internal audience
Analytics and reporting	1. Social media analytics techniques are used to show the progress in achieving objectives identified at the first stage. 2. Analytics results are reported to managers and internal audience or sent on demand.	

5.2.0. Experiment and exploration

Before investing in social media, advocators of idea inside business should monitor UGC in SMBP(s), in addition to UGC in competitors' SMBP(s) if there was. Dawson (2009) proposed monitoring customers/ prospects opinions regarding the business as a critical task in her social media strategy framework. Meanwhile, Safko and Brake (2008) discussed the importance of analyzing audience presence in social media. Studies by both Lacka and Chong(2016) and Werder et al. (2014) indicated that social media succeeds with some businesses, fails with others and takes more time to stabilize with others, and this is consistent with study finding (table 4.5) that shows that employees believe that some business units have more potential to gain improvement in their performance than others. If business found an adequate volume of related UGC then it can move ahead and invest in social media adoption, otherwise, if there was no or limited UGC even after business goes in the process of adopting social media systematically and then social media may not fitting its business type, industry or perhaps business unit and investment on social media should be limited or stopped. In his social media model; Kerkhofs

has a supporting this position through having “go / no go moment” stage where a decision taken by investing in social media or not, based on whether it will solve the problem(s) of underlying business (units) (Kooi, no date). At this preliminary stage, advocators of social media inside the business are informally exploring prospected platforms and learning their features. Models by El-Din et al. (2017), Duane and O’Reilly (2016) and Dawson (2009) are aligned with this requirement as they suggested exploring and learning about social medial platforms as a prerequisite of deployment.

5.2.1. Setting objectives and measurement system

Adopting social media in business is not a goal itself (Kooi, no date); therefore, it is must for the company to specify at the early beginning the objectives of adoption and benefiting units since social media doesn’t affect all business aspects. To the best of the researcher’s knowledge, setting objectives of social media use is agreed on by all previous scholars in their frameworks.

The journey of social media adoption starts with identifying business objectives then setting up the measurement system, which was missed by surveyed employees as they appear not informed about the performance of business units (table 4.4).

Directors of units that may gain enhancement in performance from the use of social media and this enhancement could be tracked using the web, and social media are cooperating with social media specialists for explaining how their units will take advantage from social media adoption, and then specifying business performance indicators and metrics of such indicators. Based on business performance indicators, objectives from the use of social media, social media performance indicators and related metrics are specified.

Studies by Werder et al.(2014) and El-Din et al. (2017) introduced aligning business objectives with social media objectives as a vital ingredient of their adoption frameworks. Further, Bogéa

and Brito (2017), Duane and O'Reilly (2016) and the Hamid(2020) considered lack of results demonstrability as a factor that hinders getting management support. Alberghini et al. (2014) at his study for managing and monitoring the use of social media inside the organization, found that the right KPIs should be identified for evaluating employees' engagement with SMBPs. Having a well-identified set of metrics simplifies assessing engagement level of units' representatives who are responsible for publishing content and interacting with customers and exploring cases of social media misuse.

Social media and web metrics that could be used to assess achievement of social media objectives could be shares, likes, followers, views, mentions, number of website visitors, sources of referrals to the business website, visit length, etc. but relying only on such quantitative measures (Ney, 2016) or what is called vanity metrics (Rogers, 2018) are not giving decision-makers real image regarding their image in the eyes of their customers and how well they are performing in social media. Other metrics such as sentiments, influencers engaged with the organization and other metrics gained through SMA techniques that had been discussed at the previous chapter enables taking informative decisions by executives and decision-makers and giving them clear insight regarding their image in customers' eyes.

Four detailed examples of business objectives that could be achieved through the use of social media are discussed at Appendix B. The examples are clarifying the relationship between business unit objectives with social media objectives and metrics that should be used for measuring them.

5.2.2. Resources identification

Human resources, IT infrastructure, and budget required for social media adoption are meant by resources at this stage.

As in all software projects; social media adoption could be conducted internally or outsourced to a third party (Stair and Reynolds, 2010,Duane and O'Reilly,2016, El-Din et al., 2017), or conducted internally via identified social media teamwork. The size of the team and its power are increasing with time (Duane and O'Reilly, 2016) as business goes more in-depth in the adoption process. Recalling the previous section, directors of units that could benefit from social media adoption are specifying business performance indicators of underlying business perspectives and metrics of such indicators then communicating them to social media specialists to develop corresponding social performance indicators that should be analyzed.

At this stage, social media specialists are choosing the platform(s) that will host SMBP(s). Social media platform(s) that will host SMBP(s) is selected with regard to required social media performance indicators, platform's popularity in the country-the result of the study (table 2.3) and international statistics (figure 2.4) had shown the domination of a particular platform in Sudan- , policies and degree of freedom in targeted countries (El-Din et al., 2017) are also considered when selecting the platform, since, some governments are censoring social media and internet (Monggilo, 2016). Also, building blocks of social media platform (Kietzmann et al., 2011) should be considered, and blocks that are expected to support targeted performance indicators should be given more attention when selecting the platform (Felix et al., 2017).

The specifications of social media management and analysis software are set by social media specialists and discussed with management for approving a budget for financing social media adoption process. Management is often resisting new projects since they lack demonstrable results that show the effect of technologies or methodologies adoption on business performance, this requires identifying business performance metrics that should be tracked and how they could be supported and tracked through the use of social media and providing demonstrations about

them to the management. Table 4.2 of the study results had shown that social media metrics were not reported for the surveyed sample.

Furthermore, human resources needed for ICT operations related to social media adoption and representatives of underlying business units are selected, and responsibilities towards SMBP(s) are conveyed to them after referring social media policy which will be discussed next.

5.2.3. Governance

A lot of organizations settled social media policy to govern employees' use of social media platforms (Schmidt and O'Connor, 2015). Social media policy is a result of the cooperation of management and legal counsel who is formulating social media policy that states acceptable and non-acceptable behaviour in social media and copes with national labour regulations; this position is aligned with Schmidt and O'Connor (2015) position which was recommending referral to rules of federal labour.

It is worthy to note that formulating a completed social media policy is a time-consuming process since as time goes and business dives more in-depth in the use of social media, new cases are emerging (Mergel, 2016). The policy might be delivered as a chapter of the employee's handbook.

Another issue handled by social media is the development of procedures used for mitigating risks caused by not being at social media at all, handling content that harms business reputation (Effing and Spil, 2016) due to internal audience misuse of social media when employee's identity in social media shows that he\ she belongs to the business or external audience posts, corrective actions of such abuse should be identified in social media policy.

Quality of content published in SMBP(s) and identification of liable content writers is another issue that should be handled by social media policy. Study result (table 4.9) shows that

employees were not interested in interacting with SMBPs, this could happen because business was not assigned the task of posting in social media to particular staff members; this makes them feel that they are not liable regarding SMBP(s). This finding distinguishes social media policy guidelines of this study over that by Schmidt and O'Connor's (2015) via revealing the importance of identifying who is responsible for managing SMBP(s).

Moreover, employees should commit guidelines of posting in social media when the employer is identified; also complying etiquette is a must when replying customers in social media. Violations such as revealing sensitive information related to business, violating copyright laws, discussing work environment and actions that harm business image have to be stated as unacceptable attitudes in social media policy.

Although the formulation of social media policy regulates the use of such technology, adds value to the business, mitigates threats resulting from both internal and external social media actors and allows applying accountability; formalizing the use of social media via the development of social media policies was underestimated in the literature (Haynes, 2016).

5.2.4. Engagement

After agreement on hosting social media platform(s), pilot SMBP(s) have to be launched and announced in traditional media and organization's website. It has been apparent that surveyed staff awareness regarding extant SMBP(s) was extremely varied (table 4.9); this implies introducing the pilot SMBP(s) to in traditional media and organization's website to extend audience base and staff awareness.

The audience could be classified as external such as customers/ prospects and suppliers or internal such as employees, and each group could be classified later, this implies designing different content for each targeted group. Pepe and Bournique (2017) have suggested that

marketing effort should target a specific group(s) of the audience, which implies defining the targeted group (Hofmann, 2019) based on criteria such as interests (Safko and Brake, 2008) and demographics.

Thereafter, high-quality content should be published at times that ensure high view rates, and audience network should be built and interacted with to keep them engaged (Zhang et al., 2015). High-quality content lets the audience perceive the value of business, products or services. One of the study results has shown employees non-satisfaction with regard to business engagement with SMBP(s) (table 4.2); this could be attributed to unspecified team players and responsibilities as discussed in the previous section. Feeling not liable for interaction with SMBP lead to lack of interaction or publishing low-quality content, quality of published content is positively affecting audience engagement as found by Bahga et al. (2016).

Engagement with customers goes concurrently with the stage of analytics and reporting for the sake of discovering risky content in (near) real-time, which enables taking corrective action that mitigates such risk.

Engagement involves monitoring what is going on in conversations so that business knows what audience are saying about it and its competitors, manage risks of comments disseminated from disgruntled customers or even employees, defamation against the organization and its employees, in addition to engaging in conversations with customers and key influencers who could be identified in monitoring phase (Tsitsi et al., 2013).

5.2.5. Analytics and reporting

Business is using social media to achieve various objectives such as improving brand awareness (which is the everyday use case of using social media in a business context), ideation, revenue

generation and others (Etlinger and Li, 2011). Selected SMA and reporting techniques should fulfill users' requirements (Francia et al., 2016).

Assuming that the marketing executive wants to target the most popular customers in SMBP on Facebook with a loyalty program; social media objective here is finding the most influencing customers, and therefore letting them publish received offers to the maximum number of people in their network.

Users' graph of SMBP will be pulled through data connectors (for example relying on APIs such as Facebook's graph API as discussed in the previous), and stored for further processing in most fitting DBMS, in this case, a graph DBMS for further processing.

Thereafter, the analytics module is performing network analysis through finding nodes properties, particularly, network metrics such as degree of centrality and eigen-centrality to identify nodes with a larger number of connections extended effect to adjacent networks. Analytics results are then stored then in a relevant noSQL database like key-value waiting for reporting for those who are responsible of content management.

The system should contain GUIs that visualizes analytics results in a form scheduled, event-based reports or interactive reports based on business needs. In the example mentioned above marketing executive asks for a report presenting customers' network, the report contains nodes that have a greater degree of centrality with sizes more extensive than others or list their URLs and nodes and high light those with high degrees of centrality to consider them in marketing.

5.3. Brand Awareness

Nile University is an educational institution working in Khartoum, Sudan. The university established by Nile Higher Education Group as a college at 2007 (Nile University-edu a, 2019) and upgraded to university at 2019 (Nile University-edu b, 2019).

Nile University was aiming to increase its brand awareness in the market through several mediums; one of those mediums was institute's website which in turn–as well as all business websites-is targeting increasing awareness (Budd, 2012) toward the institute.

Using this use case, the researcher aims to show how businesses were only focusing on technology use and underestimating the importance of identifying business objectives and relating them to social media objectives.

Sources of referring traffic to the institute's website collected for the period since 8th May 2018 to 18th August 2018. The institute is using WordPress for website development. Therefore one of the website administrators asked to install Google Analytics Dashboard for WordPress (GADWP) plug-in in WordPress, to enable collecting web data to be analyzed later, then using Google Analytics the referral sources (websites that from where the traffic goes to institute's website) for the underlying period analyzed to reveal the percentage of referrals that is coming from SMBP on Facebook to evaluate its performance and taking corrective actions if needed.

Data collected by Google Analytics, Figure 5.2.a shows that the 58.4 of institute's website visits were originating from Facebook (m.facebook.com, l.facebook.com, lm.facebook.com, and facebook.com) which indicates its importance in attracting attention to the institute. In the context of engagement, taking a look at the average of session duration can tell that most average time was spent on the website also was 16 minutes and was also originating from those who were coming from Facebook. Perhaps those measurements are looking fancy and indicate how powerful the institute's SMBP on Facebook is. However, taking an in-depth look at (figure 5.2.b) shows that goals of conversions metrics were zeroed which indicates to the absence of objectives identification and its attached activities; which in turns should be set up in analytics tool for the sake of comparing achieved goals with targeted ones. The web site has a student registration

page that could be set up as the destination in goals part of Google Analytics to measure the number of leads (e-payment is not a part of the registration process).

Source	Acquisition			Behavior		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration
	81 % of Total: 21.77% (372)	**68** % of Total: 18.28% (372)	**133** % of Total: 22.20% (599)	**46.62%** Avg for View: 52.09% (-10.50%)	**2.99** Avg for View: 2.65 (12.74%)	**00:05:11** Avg for View: 00:04:05 (26.70%)
1. m.facebook.com	**25** (29.07%)	22 (32.35%)	25 (18.80%)	60.00%	2.32	00:01:28
2. lm.facebook.com	**18** (20.93%)	12 (17.65%)	25 (18.80%)	32.00%	2.60	00:03:09
3. ar.m.wikipedia.org	**17** (19.77%)	16 (23.53%)	17 (12.78%)	52.94%	2.59	00:03:31
4. l.facebook.com	**6** (6.98%)	5 (7.35%)	43 (32.33%)	46.51%	3.53	00:08:34
5. wikiwand.com	**6** (6.98%)	2 (2.94%)	8 (6.02%)	50.00%	4.25	00:07:49
6. t.co	**4** (4.65%)	3 (4.41%)	4 (3.01%)	50.00%	2.00	00:00:25
7. ar.wikipedia.org	**3** (3.49%)	3 (4.41%)	3 (2.26%)	0.00%	4.00	00:04:44
8. webometrics.info	**2** (2.33%)	1 (1.47%)	3 (2.26%)	66.67%	1.67	00:07:43
9. arabo.com	**1** (1.16%)	0 (0.00%)	1 (0.75%)	0.00%	6.00	00:02:08
10. facebook.com	**1** (1.16%)	1 (1.47%)	1 (0.75%)	0.00%	9.00	00:16:09

Figure 5.2.a: Source analytics of referrals sources.

Behavior			Conversions		
Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
46.62% Avg for View: 52.09% (-10.50%)	2.99 Avg for View: 2.65 (12.74%)	00:05:11 Avg for View: 00:04:05 (26.70%)	0.00% Avg for View: 0.00% (0.00%)	0 % of Total: 0.00% (0)	$0.00 % of Total: 0.00% ($0.00)
60.00%	2.32	00:01:28	0.00%	0 (0.00%)	$0.00 (0.00%)
32.00%	2.60	00:03:09	0.00%	0 (0.00%)	$0.00 (0.00%)
52.94%	2.59	00:03:31	0.00%	0 (0.00%)	$0.00 (0.00%)
46.51%	3.53	00:08:34	0.00%	0 (0.00%)	$0.00 (0.00%)
50.00%	4.25	00:07:49	0.00%	0 (0.00%)	$0.00 (0.00%)
50.00%	2.00	00:00:25	0.00%	0 (0.00%)	$0.00 (0.00%)
0.00%	4.00	00:04:44	0.00%	0 (0.00%)	$0.00 (0.00%)
66.67%	1.67	00:07:43	0.00%	0 (0.00%)	$0.00 (0.00%)
0.00%	6.00	00:02:08	0.00%	0 (0.00%)	$0.00 (0.00%)
0.00%	9.00	00:16:09	0.00%	0 (0.00%)	$0.00 (0.00%)

Figure 5.2.b: Behavior analytics of referrals sources.

Notes:

1. Source (also called referral or referring source) is the website that contains the link that directs the visitor to another website (The Economic Times, 2020, Ryte Wiki, no date).
2. l.facebook.com and lm.facebook.com indicates that issues related to privacy and security had been checked (such as checking malicious or spammy links) or resolved (such as anonimizing user) by Facebook's Link Shim service for users desktop (laptop) or mobile devices, respectively (Großmann, 2020, Sharma, no date).

It has been noticeable that the institute identified human resources and has good ICT infrastructure. Still, it may have shortcomings in training aspect or at best case objectives

identification aspect which leads to problems in identifying business objectives and linking them to correct objectives that should be achieved via both social media and web.

5.4. Competitive Intelligence

Operator A is a relative newcomer to the telecommunications market in Sudan; operator A's main topics in their Facebook SMBP are offers, greetings and events ads, competitions and award lotteries.

By analyzing operator A's content and operator B's one, the researcher discovered that operator B is also advertising for recruitment which improves brand awareness via leading applicants to its website and improves the number of applying people through a new communication channel if operator A was monitoring operator B's SMBP they can gain competitive advantage and strengthen its SMBP. Through this use case, the researcher was aiming to show the importance of monitoring competitors practice in social media.

Posts of the operator A and operator B scraped from their official SMBP's on Facebook, and manual content analysis was performed on the posts published at the period from Oct. 2017 to Dec. 2017 (360 posts after excluding 11 empty posts). Each post whether it was textual, video or photo related to one of four topics offers, greetings and events ads, competitions and award lotteries, and vacancies adds which was only adopted by operator B.

Samples of contents of both operators are shown in table 5.2.

Table 5.2.A Sample content of use case operators

Topic	Operator	Example Post(s)
	B	"الفيسبوكمجان .. مع #زين_سودانالشراكةبينزينالسُودانوفيسبوك https://youtu.be/VPJoboCW2Dg عروض_زين# زين_عالم_جميل# #Zain_Free_Facebook
Greetings & Events' Ads	A	"جمعةمباركة" " مهرجانكرمكولالدوليملتقىللتبادلالثقافيالدولي،بينالفنونالسودانيةومختاراتمنالعروضالعالمية. موسيقى،سينما،مسرح،فنونبصريةوأدبيرعايةMTN "
	B	"نقل مباشر لإحتفال زين "" ليلة في حب الوطن"" من المسرح الرئيسى بقاعة الصداقة ويمكنكم متابعة الحفل عبر تلفزيون السودان، قناة النيل الازرق، قناة الشروق وقناة أمدرمان.. متابعة طيبة نتمناها لكم ... وكل عام والشعب السودانى فى تقدم ورفعة وإزدهار. #ليلة_في_حب_الوطن #زين_السودان"
Competitions & Awards Lottery	A	"مسابقة MTN لعيد الاستقلال في عيد استقلال وطننا السودان، شارك في مسابقتنا و اربح ايفون 8 أو 10 قيقابايت 4 Gهدية من .MTN شروط المسابقة: لايك علي صفحة MTN SUDANشير للمسابقة علي صفحتك الخاصة #احتفل_واربح"#MTNSudan "السحب الاسبوعي لجنيهات الذهب علي قناة سودانية 24 ضيف الحلقة السيد / مالك ميلامو المدير التنفيذي لشركة MTN سودان والسيد / عبدالله الفاضل مدير عام شئون قطاع المؤسسة وترقبوا مفاجأة الحلقة"
	B	ماهو اسم المؤتمر الذي عل كواجهة ثقافية لطلاب المعاهد العليا وطالب فورا بتصفية " "الاستعمار؟
Vacancies' Advertisements	A	Not found
	B	".. مرحباًبكفيعالم #زين . آخِرموعدللتقديم 25 يناير 2018

		للمزيدمنالتفاصيلوتقديمالطلباتزوروا موقعناالإلكتروني : https://careers.Zain.com/careers/Zaingroup/home.aspx #وظائف_زين #زين_عالم_جميل"

Analysis results inform that operator B is surpassing its competitor regarding the number of posts and also having a new posts category (job advertisement) as depicted in figure 5.2. Such results show that business should monitor online competitor's activities to take advantages over them. Also, the organization can go further and know from comments the sentiments of competitor's customers and their aspirations. The results show the importance of learning from competitors best practices.

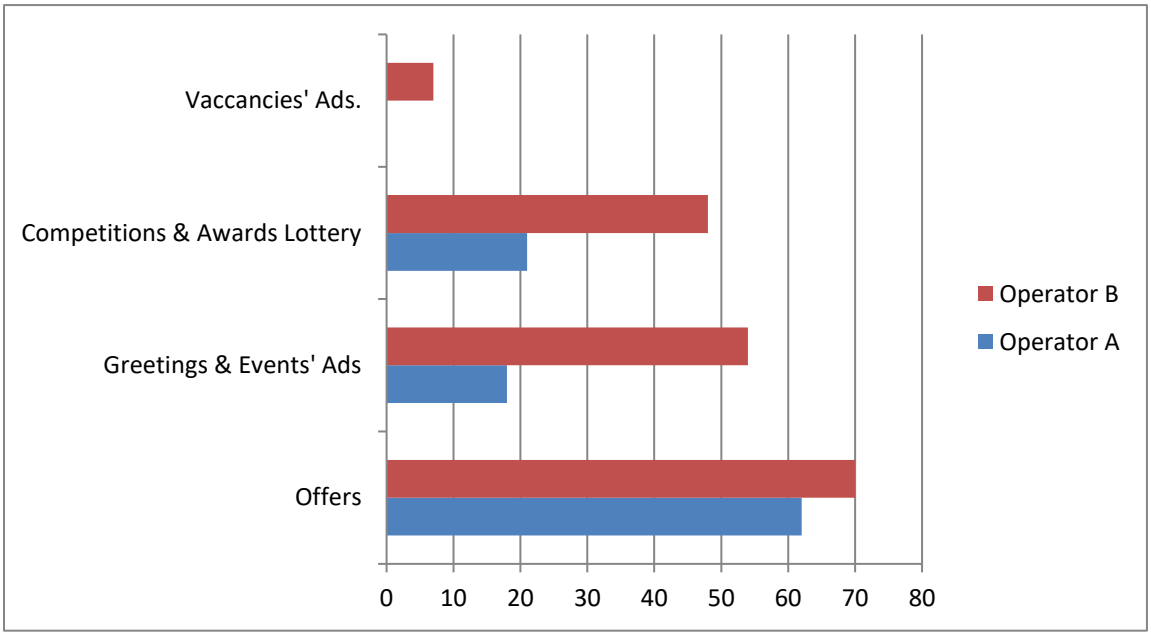


Figure 5.2: Number of posts in main topics at SMBP

5.5 Summary

This chapter discussed the two use cases of how business value could be gained or missed through considering various items of solution framework during social media adoption.

The use cases are about raising brand awareness and gaining competitive advantage respectively; proving the validity of the framework was achieved through analyzing web data and UGC of customers in businesses' SMBPs and to show missed chances by the firm when ignoring some items of solution framework. The research will be concluded in the next chapter.

CHAPTER VI

Conclusions and Recommendations

6.1 Introduction

After completing all phases of this research project from inception and research design to data collection and presentation of research findings, this final chapter draws this thesis to a close. This chapter begins with an overview of the undertaken research followed by the underlying conclusions. Implications of the research findings are then discussed in terms of both academia and industry. All the limitations of this research are clearly identified, followed by a discussion of recommendations. This paves the way for further research within the communities. By doing so, the communities can address and consider the future. This can also allow the additional value of the research efforts to be obtained.

6.2 Reflection on Research Questions

Rising use of social media in the business context and implementing SMA on business-related content in social media implies using such technologies in a strategic approach. In the last decade, several social media frameworks have been introduced with the aim of systemizing organizational use of social media in business. Majority of reviewed frameworks was overlooking the process of defining relevant business performance indicators and linking them to their counterparts of social media performance indicators so that they could help in decision

making. This research is setting guidelines for identifying and selecting the right performance indicators of both business and social media, so that they reflect progress in business performance. Further, in contrast to current literature which dealt with implementing social media strategy and implementing social media itself in business as a separated concern that undertaken from a managerial perspective, this work is consolidating both concerns and considering technical aspects of handling social media data in a way that serves business performance. Recalling that the objective of this research is:

This research targets developing a framework for social media adoption in business, so that it could be applicable for the business that uses or intends to use social media.

The main research question is:

How can the business gain value from the use of social media in the business context?

The main research question yielded three sub-questions answered during the research period as follow:

R.Q.1. What is the current status of social media adoption in the business context?

Social media is a set of internet-based applications that apply web 2.0 concepts via enabling individuals' interaction and sharing of their content with others on the web. Social media platforms are varying concerning primary functionality, data acquisition approaches, data formats, these attributes in addition to massive amounts of quickly generated data is attributing them as big data and requires the use of its processing techniques. Businesses nowadays are utilizing social media in various areas such as marketing, branding, innovating new products and services, recruitment, after-sales services and others. Moreover, other businesses took a step forward through using the web and social media analytic techniques to purposefully analyze users' behaviour in web and UGC in their social media channels and web, so that they could gain

insights about various issues such as the progress of marketing campaigns, customers' sentiments, customers' engagement, threats for business image and others.

RQ.2. How relevant can social media impact on business be effectively identified?

As indicated in Chapter II and supported with analysis results in Chapter V; business areas are varying with regard to the level of gained value from use of social media, so we can say that business has to focus with business performance indicators that could be affected by the use of social media and/ or tracked through corresponding social media performance indicators.

Reporting progress of social media performance indicators is resulting from applying SMA techniques that fulfill requirements of underlying business area (unit). As indicated in Chapter III, data produced from different social media platforms, are challenging in terms of ingestion from various data sources, data formats, and their analytics needs which depend on targeted performance indicators.

RQ.3. What are the needed activities for adopting social media by business?

Although social media adoption frameworks had been studied in the last decade, stakeholders and factors affecting adoption process were relatively overlooked. This research considers stakeholders as a vital source for requirements, external and internal factors that could affect adoption had been considered too.

Developing and adopting systems that are utilizing social media as well as other IT systems often faces obstacles such as management resistance for change, lack of required skills needed for the ongoing development activities, business ignorance of setting and updating IT policies and unsatisfactory technological diffusion in business and country in general.

Usually, management tends to reject new projects unless it realizes the ROI, results of the analysis in Chapter V show that a large sector of managers does not perceive returns from

investing on social media which in turn makes approving the adoption of social media with all associated resources a challenging task. The researcher tackled this issue via working on two aspects; at the very beginning setting measurement system that relates social media performance to business performance, this implies involving representatives of units that will be affected from adoption to revise the set of performance indicators and related metrics for their departments and approve corresponding social media performance indicators and associated metrics. Eventually, using the right visualization techniques to make results demonstrable to management to evaluate the system's feasibility at the beginning and make actionable decisions to improve business performance after system implementation.

Furthermore, the availability of qualified staff and needed resources for capacity building has a strong effect on adoption project and positively correlated to management support which in turn dependant on results demonstrability, figure 6.1 elucidates the idea.

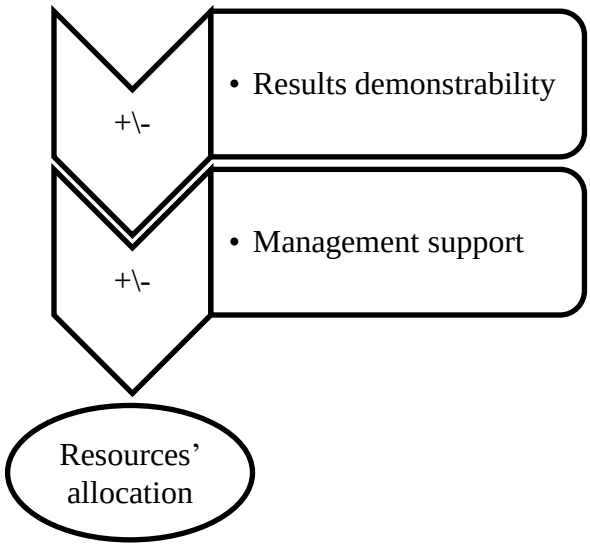


Figure 6.1 Effect of demonstrable results upon resources allocation

Although social media was adopted in majority of businesses in the examined sample, the analysis results reveals that around half of staff was unsatisfied about business engagement level

at business channels in social media, to address the issue of undefined responsibilities concerning SMBP, the researcher suggested that the social media policy should identify social media team, their responsibilities and accepted and non-accepted behaviour in web and SMBP(s).

Statistics have shown that the percentage of internet users and therefore, social media users are small in comparison with countries in the neighborhood due to several factors, especially economic and political ones. This negatively affects business dependency on social media as a channel that add value to business even if other factors such as having management support, an adequate level of training programs and well-formulated social media policies.

6.3.Research Contribution

There are a few pieces of research that examine social media adoption in the business context and consider adoption process as a whole in addition to the implementation of social media itself; this makes the research contributes to the knowledge via produced findings.

This work contributes through adding social media adoption framework acts as a blueprint for practitioners; the framework is identifying participants, their needs and how to gain more from them and decrease troubles caused by them, and factors that are affecting the adoption process, which was missed by other frameworks. Furthermore, frameworks by other scholars were considering managerial aspects of addressing social media adoption meanwhile this framework is relating the administrative issues of selecting business objectives with technical one that concerns with picking up only needed technological solution for analytics. Figure 6.2shows relationship between research objectives, findings and main phases of the research.

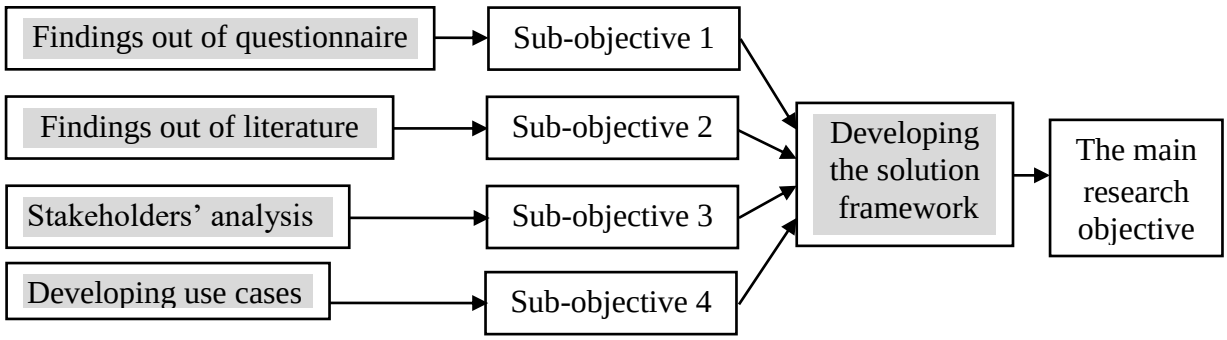


Figure 6.2 Research objectives and counterpart research findings and phases

6.4Research Implications

Anticipated implications of research findings and results on academic and practitioners' communities are discussed in the next sub-sections.

6.4.1. Implications for academia

The research implication for academia is provided in the form of a conceptual model for adopting social media by the business. The model is elucidating activities within stages of the adoption process, factors that may hinder the process and insider/ outsider practitioners involved in the adoption process.

6.4.2. Implications for practice

The research is helping heads of units who aim to utilize social media to decide whether their units will gain from such use and therefore formulate the right measurement system. Recalling that one finding of primary data analysis emphasized identifying performance indicators that could be supported and tracked through SMA. This, in turn, leads to a decline in the cost of implementing technology, since only needed solution software that copes with required analytics tasks will be acquired and integrated within the analytics system.

Moreover, the research result that is emphasizing on the importance of formulating social media policy assigns roles of those who are liable of representing business in social media and specify their roles; this result is providing management with a guideline for addressing issues related to employees interaction with social media; via identifying participants, roles and expected and forbidden acts in social media; all this is defined in a referential source, namely social media policy.

6.5 Limitations and Recommendations

This section indicates the limitations of this research; to allow utilizing research findings in the appropriate context.

Primary data representing Sudan's perspective since it is collected from various businesses in Sudan, this leads to the fact that the research findings may not suit other countries. It is recommended for future researches to cover a broader range of countries.

Moreover, a cross-sectional analysis is applied on primary data, this raises the fact that responses are representing a particular period of time; therefore, findings are changing prone over time as a result of changes in factors mentioned in Chapter II. It is recommended for future researches to conduct a longitudinal survey (i.e. collecting responses from the same correspondents multiple times over a long period to reflect changes -in their responses- that was resulting from the change in surrounding factors.

Furthermore, the developed use cases were not designed to validate the whole framework, and only specific requirements had been validated due to time limits.

6.6Summary

This chapter is summarizing the research through recalling research objective, stating and answering research questions. Limitations of this research are also identified in association with recommended actions to enhance the solution framework in future.

Furthermore, research implications on both academia and practice were covered, and then research significance highlighted.

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APPENDICES

Appendix A.1

A Questionnaire about the use of social media in organization(Arabic version)
استبيان استخدام وسائط التواصل الاجتماعي وأثره على المؤسسات بالسودان

في حالة وجود لبس في معنى بعض المصطلحات أو الأسئلة لاتتردد في الاتصال بالرقم 09249920855626 أو الارسال

للعنوان alrawdahamid@gmail.com

1. **الجنس** □ ذكر □ أنثى
2. **ماهي طبيعة نشاط المؤسسة؟**

□الاتصالات □التصنيع □النفط والطاقة □الاعلام □التعليم

□الخدمات الطبية□البنوك والتمويل □غيرها، الرجاء ذكرها .....

3. **هل أنت مدير/ رئيس قسم؟**□نعم□لا
4. **ماهو حجم مؤسستك؟**

□صغير (1-50 موظف) □ متوسط (51-250 موظف) □ كبير (اكثر من 250)

5. **في أي قسم تعمل؟**

□المبيعات □التسويق□ تقانة المعلومات □شؤون الأفراد □غيرها، الرجاء ذكرها .....

6. **هل لديك حساب نشط (قمت باستخدامه خلال الثلاثة شهور الأخيرة) في مواقع التواصل الاجتماعي؟**

□ نعم □لا

7. **اذا كانت الاجابة بنعم حدد وسائط التواصل الاجتماعي التي تستخدمها؟**

□ Facebook □ Twitter □LinkedIn □Instagram□أخرى، اذكرها .....

8. **هل لدى مؤسستك تواجد (صفحة/ حساب/ قناة) على مواقع التواصل الاجتماعي؟**

□ نعم □ لا □لاأعرف

9. **اذا كانت الاجابة بنعم حدد وسائط التواصل الاجتماعي التي تستخدمها مؤسستك ؟**

□Facebook □Twitter □LinkedIn □Youtube □Instagram

□ أخرى، اذكرها ..... □موقع تواصل اجتماعي داخلي خاص بالشركة

10. **ماهو معدل تصفحك او تفاعلك مع حسابات مؤسستك في وسائط التواصل الاجتماعي؟**

□ يعتمد على أهمية الاخبار التي تظهر لدي □ مرة أو أكثر في اليوم

□على الأقل مرة كل شهر □ لاأتصفحها على الاطلاق

11. المحتوى الخاص بمؤسستك في وسائط التواصل الاجتماعي التابعة لمؤسستك ومستوى تفاعل المؤسسة مع المستخدمين جيد؟

□أوافق بشدة □ أوافق □ محايد □ أرفض □أرفض بشدة

12. هل يعود تواجد المؤسسة في وسائط التواصل الاجتماعي بالفائدة عليها عموما؟

□نعم □لا □ لا أعرف

13. هل تعرف ماهي الأهداف التي يجب أن يصل اليها قسمك بنهاية فترة زمنية معينة (مثلا: الربع الاول، منتصف أو ثلاثة أرباع السنة)؟

□نعم □لا

14. كيف يتم حساب هذه الأهداف؟

□ عدد العناصر التي تم بيعها □عدد الاتفاقات/التعاقدات الجديدة □عدد الزبائن الجدد

□الزيادة في العائدات □غيرها، الرجاء ذكرها ..... □لاأعرف

15. هل يعود تواجد المؤسسة في وسائط التواصل الاجتماعي بالفائدة على القسم الذي تعمل فيه؟

□نعم □لا □لاتوجد وسائل لتقييم مدى الفائدة التي تعود منها

16. هل تقوم مؤسستك بعرض ملخصات للقياسات (آراء المعلقين، عدد المشاهدات، التعليقات، المشاركات، إلخ.) الخاصة بصفحتها/ مجموعتها/ حسابها/ قناتها في وسائط التواصل الاجتماعي سواء في أحد أنظمتها أو موقعها الالكتروني او ارسالها للمختصين في شكل ورقي أو الكتروني؟

□ نعم □ لا □لاأعرف

17. ماهي المجالات التي تقترح أن تنشط المؤسسة في اضافة محتوى متعلق بها والتفاعل مع المتعاملين مع الحساب؟

□ العلاقات مع العملاء كتقييم رضاهم والحفاظ عليهم وتوسيع قاعدتهم

□الأداء التشغيلي كمعدلاتالانتاجوالسلامة

□ العلاقات مع الموظفين كتقييم رضاهم والحفاظ عليهم وجذب كوادر مؤهلة

□جودة المنتجات/الخدمات وتتضمن تقليل معدلات الخطأ والمكافأة على الجودة

□التحالف مع مؤسسات أخرى والذي يشمل الانتاج المشترك او تصميم المنتجات او المشاريع المشتركة

□عرض ومناقشة النتائج المالية قصيرة المدى كالارباح السنوية وتقليل التكلفة والعائدات من الأصول.

□الابتكار والذي يشمل تطوير منتجات/ خدمات او ابتكار منتجات/ خدمات جديدة

18. هل تعتقد أنه اذا استخدمت بعض الاقسام في المؤسسة وسائط التواصل الاجتماعي بصورة جيدة فان ذلك سيعود بالنفع على هذه الاقسام؟

□ نعم □لا

يرجى الاجابة على الاسئلة التالية في شكل نقاط لاتتجاوز الواحدة 5 كلمات.

19. اذا كانت الاجابة على السؤال السابق بنعم ماهي الفوائد التي تتوقع ان تعود على القسم المعني اذا تم استخدام وسائط التواصل الاجتماعي بصورة جيدة؟

- _____
- _____
- _____
- _____
- _____

20. ماهي اقتراحاتك لتحسين اداء حساب/ات المؤسسة في وسائط التواصل الاجتماعي؟

- _____
- _____
- _____
- _____
- _____

شكرا لوقتك

Appendix A.2

A Questionnaire about the use of social media in organization in Khartoum (English version)

A Questionnaire about the Use of Social Media and its Impact on Organization in Sudan

Note: in case you found some terms or questions unclear please don't hesitate contacting me in 0920855626 or alrawdahamid@gmail.com

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1. Gender: □ Male □ Female

2. What is business type your organization is working in?

□ Telecom □ Manufacturing □Oil & Energy □Media □Education

□ Medical Services □Banking & Finance □ Other, please mention:……

3. Are you a manager/ head of department? □ Yes □ No

4. What is the size of your organization?

□ Small (1-50 employees) □ Medium (51-250 employees) □Large (> 250 employees)

5. In which department you are working?

□ Sales □ Marketing □Public Relations □IT □ HR □ Other, please mention:……

6. Do you have an active (used in the last three months) account(s) in social media platforms?□ Yes □ No

7. If the answer of the previous question was *YES* identify social media platforms you are using?

□ Facebook □ Twitter □ LinkedIn □Instagram □Others, list them ……

8. Did your organization have a presence in social media platforms?

□ Yes □ No □ I don't know

9. If the answer of the previous question was *YES* identify social media platforms used by your organization?

□Facebook □Twitter □LinkedIn □YouTube □Instagram□ An internal – used only by the organization- social media platform

□ Others, list them ……

10. What is the average that you browse/interact with accounts of your organization in social media?

□ It depends on importance of news feed □Once or more daily

□ At least once monthly □ I don't browse it at all

11. The content made by organization in social media and level of organization's interaction with customers is good:

□ I strongly agree □ I agree □ Neutral □ I disagree □ I strongly disagree

12. Does organization's presence in social media brings a value to organization?

□ Yes □ No □ I don't know

13. Do you know the objectives that should be reached by your department by the end of a specific time period (e.g. first quarter, middle, ¾ or end of the year)?

□ Yes □ No □ I don't know

14. How those objectives are measured?

□Number of sold items □Number of new deals\ contracts □Number of new customers

□ Increment in revenues

□Others, list them ……

□ I don't know

15. Does organization's presence in social media brings a value to your department?

□ Yes □ No □ I don't know

16. Does your organization presents summaries of social media metrics (i.e. total of likes, shares, views, followers, negative/ positive comments) of its page/ group/ account/ channel in social media in their website or its page/ group/ account/ channel or even at paper/digital reports?

□ Yes □ No □ I don't know

17. What are the areas that you suggest business to add content for and interact with users in the account?

□Customers' relationships such as keeping them satisfied, preserving them and expanding customers' base

□ Innovation which includes products/ services development and innovating new products/ services

□ Operational performance such as production rates and safety

□ Employee's relationships such as keeping them satisfied and attracting qualified staff

□ Product/ service quality such as error rates and incentives for quality

□ Alliancing with other organizations which includes co-production, products design or collaborated projects

□ Presenting and discussing short term financial results such as annual profits, returns from assets and decreasing cost.

18. Do you think that if some departments properly used social media platforms, this will benefit those departments?

□ Yes □ No □ I don't know

Please answer the following questions in a form of points each with five words at most.

19. If the answer of the previous question is *YES*, what are the expected benefits for the underlying department, if social media is properly used?

●———————————————

●———————————————

●———————————————

●———————————————

●———————————————

20. What are your suggestions for improving performance of business's social media account(s)?

●———————————————

●———————————————

●———————————————

●———————————————

●———————————————

Thanks for your time

Appendix B

Example Business objectives, originating business unit objectives, social media objectives and metrics- Inspired from (Etlinger and Li, 2011)

1. **Business Objective:** Cost saving

   Example Business Unit: Call center

   Business Unit Objective: Reducing costs of one to one calls via reducing their number

   Social Media Objective: Resolving all incoming queries in business social media profile correctly and quickly

   Social Media Metrics/ calculation method: Number of issues resolved in social media * cost per traditional call

2. **Business Objective:** Cost saving

   Example Business Unit: Marketing

   Business Unit Objective: Reducing expenditure on less effective media type or platforms among others

   Social Media Objective: Keeping good rates of conversions and leads comparing to those gained by traditional media

   Social Media Metrics/ calculation method: Comparing number of conversions and leads occurred directly in social media in brand's web site through social media platforms versus those gained through traditional media

3. **Business Objective:** keeping organization/ brand image healthy

   Example Business Unit: Public Relations

Business Unit Objective: Keep brand image healthy - Managing risk from negative WoM in social media

Social Media Objective(s):

- Having control over negative comments

- Stimulating customers to positively react with organization in social media

Social Media Metrics/ calculation method: Analyzing negative sentiments towards a specific product or service in a specific time span or targeting customers to turn them to advocates

4. **Business Objective(s):** - Customer Satisfaction

    - Cost saving

Example Business Unit: Customer service/ experience

Business Unit Objective: Improving helpdesk performance

Social Media Objective: Increasing number of issues resolved correctly in near real time through social media

Social Media Metrics/ calculation method: Calculating query post timing – answer post timing then checking whether answer is correct

Appendix C

Variable	Position	Label	Measurement Level	Role	Column Width	Alignment	Print Format	Write Format
GENDER	1	<none>	Nominal	Input	8	Right	F8	F8
BTYPE	2	Business type	Nominal	Input	7	Right	F8	F8
MANAGER	3	Manager or head of dept.	Nominal	Input	3	Right	F8	F8
ORG_SIZE	4	Organization size	Ordinal	Input	8	Right	F8	F8
DEPARTMENT	5	Department (business unit)	Nominal	Input	14	Right	F8	F8
HAVE_ACTIVE_ACC	6	Has active personal account	Nominal	Input	8	Right	F8	F8
You_have_FB	7	Has account in Facebook	Nominal	Input	8	Right	F8	F8
You_have_Twiter	8	Has account in Twitter	Nominal	Input	8	Right	F8	F8
You_have_LinkedIn	9	Has account in LinkedIn	Nominal	Input	8	Right	F8	F8
You_have_Instagram	10	Has account in Instagram	Nominal	Input	8	Right	F8	F8
ORG_IN_SM	11	Organization has SMBP	Nominal	Input	8	Right	F8	F8
ORG_have_FB	12	Organization has Facebook account	Nominal	Input	8	Right	F8	F8
ORG_have_twitter	13	Organization has Twitter account	Nominal	Input	8	Right	F8	F8
ORG_have_linkedin	14	Organization has LinkedIn account	Nominal	Input	8	Right	F8	F8
ORG_have_youtube	15	Organization has Youtube account	Nominal	Input	8	Right	F8	F8
ORG_have_insagrm	16	Organization has instagram account	Nominal	Input	8	Right	F8	F8
ORG_have_internal	17	Organization has internal social network	Nominal	Input	8	Right	F8	F8
AVERAGE	18	Time frames of your interaction with SMBP	Ordinal	Input	8	Right	F8	F8
CONTENT_AND_INTERACTION_LEVEL	19	Your evaluation of business engagement in SMBP	Ordinal	Input	8	Right	F8	F8
VALUE_TO_ORG	20	Current SMBP adds value to business	Nominal	Input	8	Right	F8	F8
KNOW_DEPT_OBJ	21	Know objectives of your department	Nominal	Input	19	Right	F8	F8

Mesured_by_sol_items	22	Objectives measured by no of sold items	Nominal	Input	8	Right	F8	F8
Mesured_by_new_deals	23	Objectives measured by no of new deals	Nominal	Input	8	Right	F8	F8
Mesured_by_new_customers	24	Objectives measured by no of new customers	Nominal	Input	8	Right	F8	F8
Mesured_by_increment_in_revenues	25	Objectives measured by increment in revenues	Nominal	Input	8	Right	F8	F8
Mesured_by_uptime_hours	26	Objectives measured by uptime hours	Nominal	Input	8	Right	F8	F8
Mesured_by_cost_saving	27	Objectives measured by cost saving	Nominal	Input	8	Right	F8	F8
Mesured_by_forms_signed	28	Objectives measured by forms signed	Nominal	Input	8	Right	F8	F8
Mesured_by_approved_projects_work_plans	29	Objectives measured by aproved projects	Nominal	Input	8	Right	F8	F8
Mesured_by_NW_KPIs	30	Objectives measured by network KPIs	Nominal	Input	8	Right	F8	F8
Mesured_by_invoice_payment	31	Objectives measured by invoice payment	Nominal	Input	8	Right	F8	F8
VALUE_TO_DEPT	32	Current SMBP adds value to department	Nominal	Input	8	Right	F8	F8
SUMMARIS_PRESENTED	33	SMBP's performance is announced to you	Nominal	Input	8	Right	F8	F8
AREAS_CRM	34	Proper use of SMBP lead to potential improvement in CRM	Nominal	Input	8	Right	F8	F8
AREAS_INNOVATION	35	Proper use of SMBP lead to potential improvement in innovation	Nominal	Input	8	Right	F8	F8
AREAS_OP_PERFORMANCE	36	Proper use of SMBP lead to potential improvement in operational performance	Nominal	Input	8	Right	F8	F8
AREAS_EMP_REL	37	Proper use of SMBP lead to potential improvement in employees relationship	Nominal	Input	8	Right	F8	F8
AREAS_QUALITY	38	Proper use of SMBP lead to potential improvement in product or service quality	Nominal	Input	8	Right	F8	F8
AREAS_ALLIANCE	39	Proper use of SMBP lead to potential improvement in alliancing	Nominal	Input	8	Right	F8	F8
AREAS_FINANCIAL	40	Proper use of SMBP lead to potential improvement in short term financial results	Nominal	Input	8	Right	F8	F8
DID_SM_USE_BENEFIT	41	Having proper SMPB will benefit the abovementioned departments	Nominal	Input	8	Right	F8	F8

Variable Values

Value		Label
GENDER	1	MALE
	2	FEMALE
BTYPE	1	TELECOM
	2	MANUFACTURING
	3	OIL & ENERGY
	4	MEDIA
	5	EDU
	6	MEDICAL
	7	BANKING
	8	Engineering
	9	Higher Education
	10	NGO
	11	Governmental ministry
MANAGER	1	YES
	2	NO
ORG_SIZE	1	SMALL(1-50)
	2	MEDIUM(51-250)
	3	LARGE(>250)
DEPARTMENT	1	SALES
	2	MARKEKTTING
	3	PR
	4	IT
	5	HR
	6	Accounting & Finance
	7	Trading
	8	Brokering
	9	Depository
	10	Procurement
	11	Construction
	12	Design
	13	Operations
	14	Projects Management
	15	Research/ statistics
	16	Projects Development
	17	Revenue Assurance
	18	Export
	19	Technical
	20	Data Entry
	21	Customer experience/ services
	22	Teaching/ Trainning
	23	Networking

	24	Academic (registration/coordination/deanship)
	25	Programs
	26	Promotion
	27	Management
	28	Media
	29	Procurement
	30	Engineering
HAVE_ACTIVE_ACC	1	YES
	2	NO
You_have_FB	1	YES
	2	NO
You_have_Twiter	1	YES
	2	NO
You_have_LinkedIn	1	YES
	2	NO
You_have_Instagram	1	YES
	2	NO
ORG_IN_SM	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_FB	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_twitter	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_linkedin	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_youtube	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_insagrm	1	YES
	2	NO
	3	I don't know
	4	Not Applicable
ORG_have_internal	1	YES
	2	NO

	3	I don't know
	4	Not Applicable
AVERAGE	1	IT DEPENDS ON IMPORTANCE
	2	ONCE OR MORE DAILY
	3	AT LEAST ONCE MONTHLY
	4	DON'T BROWSE IT AT ALL
CONTENT_AND_INTERACTION_LEVEL	1	STRONGLY AGREE
	2	AGREE
	3	NEUTRAL
	4	DISAGEE
	5	STRONGLY DISAGREE
VALUE_TO_ORG	1	YES
	2	NO
	3	I don' know
KNOW_DEPT_OBJ	1	YES
	2	NO
Mesured_by_sol_items	1	YES
	2	NO
Mesured_by_new_deals	1	YES
	2	NO
Mesured_by_new_customers	1	YES
	2	NO
Mesured_by_increment_in_revenues	1	YES
	2	NO
Mesured_by_uptime_hours	1	YES
	2	NO
Mesured_by_cost_saving	1	YES
	2	NO
Mesured_by_forms_signed	1	YES
	2	NO
Mesured_by_approved_projects_work_plans	1	YES
	2	NO
Mesured_by_NW_KPIs	1	YES
	2	NO
Mesured_by_invoice_payment	1	YES
	2	NO
VALUE_TO_DEPT	1	YES
	2	NO
	3	I DON'T KNOW
SUMMARIS_PRESENTED	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_CRM	1	YES

	2	NO
	3	I DON'T KNOW
AREAS_INNOVATION	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_OP_PERFORMANCE	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_EMP_REL	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_QUALITY	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_ALLIANCE	1	YES
	2	NO
	3	I DON'T KNOW
AREAS_FINANCIAL	1	YES
	2	NO
	3	I DON'T KNOW
DID_SM_USE_BENEFIT	1	YES
	2	NO
	3	IDON'T KNOW