

INTERDISCIPLINARY DESCRIPTION OF COMPLEX SYSTEMS

Scientific Journal

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LIST OF REFEREES

The following scholars, listed in alphabetic order of their surname, refereed manuscripts for the journal INDECS in period from December 2018 to December 2019:

Haseeb Ahmad	Paulo Mota
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Damir Miloš	

Their contribution to the quality of the Journal's content is acknowledged.

Zagreb, 27th December 2019

Josip Stepanić

INDECS AWARD

Dear authors of articles published in Vol. 16 of the journal INDECS,

the contest for the INDECS award, INDECOSA 2019, choosing of the best article published in INDECS during 2019, i.e. in Vol. 17, is opened.

The voters are you, the authors of articles published in INDECS Vol. 16, i.e. in 2018, and the members of the INDECS' Editorial Board. Each and every voter contributes with one vote.

Propositions for the INDECOSA are available from the web site of INDECOSA, <http://indec.eu/index.php?s=indecosa>.

I would like to ask you to give your vote to the article which you consider to be the best among the articles published in the year 2019.

The votes will be collected till 29th February 2020 and the results will be presented in INDECS 18(1).

Cordially,

Zagreb, 27th December 2019

Josip Stepanić

UNDERSTANDING MICRO AND MACRO INTERACTIONS IN SOCIAL NEUROBIOLOGICAL SYSTEMS

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Regular article

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ABSTRACT

The approach of complex systems as a form of new approach provides an opportunity to replace the dominant, mechanistic view of sport-related phenomena. By analyzing the micro and macro relationships of complex system components, the observer can describe well the set of states of the system. The transition between these states can be induced by internal and external forces. Understanding the motivations of smaller groups and successfully integrating this knowledge to understand higher-level elements of the system facilitates the understanding of complex transitions. The novelty is in this research that micro and macro changes are integrated as a common driver and they generate something entirely new property for the whole system. In a case study, a small soccer team is presented as a complex system. There are statuses examined and elaborated in which this small team and the members go through the observed period (2005-2009) which can be similar to other complex systems. The case study successfully mirrored the behavioural dynamics of agents in a social neurobiological system, exemplified by interactions of statuses in a team sport.

KEY WORDS

complex system, soccer, changes

CLASSIFICATION

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INTRODUCTION

Complex systems (teams, tactics) observed in sports consist of structurally and functionally heterogeneous components that interact (usually informatively and/or mechanically) with different intensities and spanning different spatial-temporal scales [1]. They are purposeful changing their behaviour and adjusting to the constraints that arise [2]. This feature significantly increases their level of complexity and is a major challenge for modelling techniques. In such systems, new forms of behaviour are constantly appearing under varying constraints, without being designed or enforced previously. This is one of the main characteristics of sport-related phenomena.

However, complex systems can behave in a simple way because their interacting components can form large coalitions of cooperative elements that reduce the dimension of the behaviour [3]. In this way, a complex system achieves simple behaviour and can be treated as a simple system at the macroscopic level [4]. On the other hand, the complex system regulates itself, it is created in a selfless organization without control, patterns, structures, can begin and then something unique happens, a completely new quality of the system is created [5]. This new quality is called the emergent feature of the complex system. More than 35 years ago, the science of complexity influenced some trends in the sport. Nowadays, systematic research has been established to observe the coordination dynamics [6]. Coordination dynamics is defined as the science of coordination, that describes, explains, and predicts how patterns of coordination form, adapt, persist, and change in living things. The aim of this field of work is to understand principles and laws that lead the dynamics of behavioural pattern formation under changing constraints (i.e., boundary conditions) [7]. These constraints may be classified into three sub-classes: task constraints, personal constraints, and environmental constraints [3]. These constraints are also reflected in the case study.

LITERATURE REVIEW

The complex system has many components, which can be complex systems themselves [8], and components can belong to multiple systems at one time [9]. There are dynamic links or interactions between the elements which reinforce or weaken each other. (positive and negative feedback) [10]. The nature of interaction can be energy, material or information exchange, or a combination of these [11]. Emergence plays a central role in theories of integrative levels and of *complex systems*. In short, it means that the system creates a new quality characteristic of it. The emerging property is somewhat expedient, but this global objective is not present in the components that make up the system: the components have local interactions, but they all make up something entirely new, which is the specific feature of the whole system [12].

Another important concept in complex system theory is a swarm intelligence [13]. Ants and bees are social insects and that individuals do not have special intelligence, but by means of interpersonal relationships (communion by pheromones) a “super-intelligence” is formed (super-intelligent in the sense that it is above the level of individuals) [14, 15]. This is typical for big cities as well. Therefore, the economic efficiency of big cities, if we look it at citizens level is far better than the villages [16]. One other simple definition of a complex system is that if we change some input parameters of the system a little bit, then the output parameters will change significantly [17]. From this simple definition, we can see that the modelling of a complex system is a very hard task [6].

METHODOLOGY

A very good example of the complex system is the social and economic organizations of people like cities [16]. In this research, were observed a soccer team as the social and

economic organizations of people. A methodology for analyzing collective behaviour within the team was used. In this case, the integrated levels interact at different scales during the performance [18]. Different techniques, tactics, physical abilities, decisions, thinking or physiological processes, creativity or social dynamics are no longer seen as isolated or independent aspects, but as interdependencies and commonalities [12]. New proposals make it possible to generate both multi-personal and individual learning and coaching strategies [19]. System behavioural variability acquires a functional value and can provide information about the states of the system (its resilience and adaptability to changes, or, conversely, its inability or inflexibility) [8, 20].

Previous studies have shown that different systems in a sports environment are very sensitive to the limitations and small changes of variables in critical areas [6, 19, 21]. The success of these investigations was that they showed some universal properties of the dynamics of complex systems, which were originally unchanged at the organizational level of the case. Various authors have studied the impact of new methods on training practitioners and the new role of athletes and coaches [21, 22]. The differentiated learning approach suggests that teams find optimal performance patterns [23] by adding noise during exercise [24]. The coaches or athletes explore the state space until they find the best solution. This research has focused on decision making and creativity in sport. For example, New activities may arise if you allow a coach or a team to explore the new region of the action workspace. The stochastic movements the environment may give rise to the invention of new and functional actions [25]. For this approach, it is important that there are independent system agents among which are defined relations. (players, coach, etc.).

CASE STUDY: SMALL SOCCER TEAM AS A COMPLEX SYSTEM

This case study describes and evaluates the novel applicability of network methods in understanding human interpersonal interactions in social neurobiological systems [24] such as a small-town soccer team on period 2005-2009 (“Electro – Vojvodina” – Szabadka – Serbia). It will be presented how collective system networks are supported by the sum of interpersonal interactions that come into view from the activity of system agents (such as players or coach of a soccer team). For example, It was observed how the interactions between the coach and the team members, influenced the team’s mood or tactics and the back effect of these changes.

During this research, were strived to make the states of the system well distinguishable. The transition from one state to the next was always time-consuming (usually half of the year). Driving forces behind each transition have tried to describe as simply as possible.

First, it will be listed the system agent and then list the attributes associated with them. In cases where it is not clear, it is also specified the attribute what value can take. Finally, system stages and transition are listed in chronological order.

The aim of the model creation is to contribute to the clarity of observed systems, Figure 1. The key elements (Agents) of system are players, coach, mood and tactics of team level. Each agent has certain attributes that can be changed over time.

Sorted list of attributes of agents:

The attributes of Players: age, experience, position in the team, motivation.

The attributes of Coach: experience, sport diplomatic influence, motivation.

The attributes of mood of the team:

- good (the players attend the training, they meet each other in private life, there are regular out-of-work activities with family members, there are constant fans),
- medium (the attendance of the training is enough, there are no common activities, few fans),
- bad (unsatisfying attendance of training, there are no common activities, there are no fans),

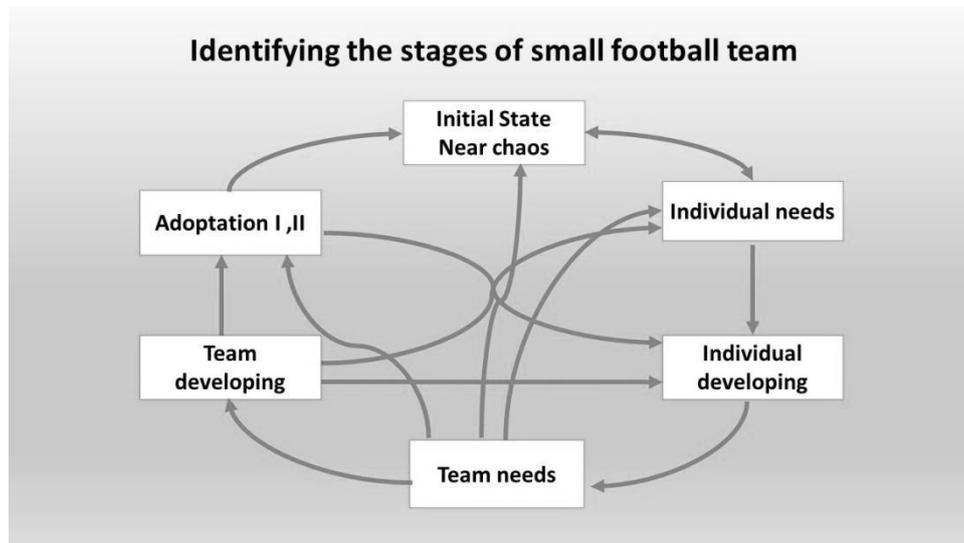


Figure 1. Stage diagram of the small soccer team.

The attributes of tactics of the team:

- good (Technical elements exist and consider the opponent's peculiarities),
- medium (Technical elements exist, but there are no adaptations to the opponent yet),
- bad (Technical elements do not exist – only individual solutions).

IDENTIFYING THE COMPLEX SYSTEM STAGES AND TRANSACTIONS BETWEEN THEM

In the initial stage will be listed all attributes of the system agents separately. In the following sections, only possible changes are shown.

Stage: Initial state – Near to chaos (season 2005/06 autumn, see Figure 1).

At the beginning of the observation, the team is on the edge of disruption. Coach motivation is very low.

Players:

- age: the average age of players 26 years,
- experience – more years,
- motivation – medium,
- position in the team – there are no positions defined for single players.

Coach:

- experience – high,
- sport diplomatic influence – high,
- motivation – low.

Team mood: Medium.

Tactics: Bad

The driving force behind transition: The old coach leaves the club. The most experienced player takes on the coach's role.

The new coach:

- experience – little,
- sport diplomatic influence – little,
- motivation – extremely high, the aim is to win the championship.

Stage: Individual needs (season 2005/06 – spring, see Figure 1)

The new coach transforms the team into the new state. The championship begins. The coach starts the training. Repairs the general mood with the increase of the quantity of the running and starts to map the players' motivation. Tries to develop smaller groups inside the team (forwards, defenders, midfielders, goalkeeper – according to the players' claims). Player's motivation increases. The team performance is good in the championships, they can surprise their opponents.

Stage: Individual developing (season 2006/07 – autumn)

During the season the coach tries to change the motivation of the players. Based on a unique survey, makes a personal workout plan. As a result, the motivation of some players improves, but the team's events are missing.

Stage: Team needs and Individual needs and Initial state (season 2006/07 – spring)

The coach's experience increases. The average age of players is growing (no new players). The coach tries to transform the posts within the team according to the team needs, so the motivation of the players is deteriorating, but the team's tactical repertoire increases. Some players are leaving the team. The team is near to chaos again.

Stage: Team developing and Individual needs and Individual developing (season 2007/08 – autumn)

Involving young talented players into specific posts within the team. The average age of players decreases. Because of the new players, motivation in the level of the team is reducing. The team score is moderate.

Stage: Adaptation I and Individual developing (season 2007/08 – spring)

Tactics level increases – adaptation to the opponent. The atmosphere is excellent. Motivation is appropriate. The team leads the championship, but another team is eliminated, and the points scored are recalculated. The coach has a low degree of sports diplomacy, so after the recalculation, they finish in the second place.

Stage: Adaptation II and Individual developing (season 2008/09 – spring and autumn)

Team tactics level increases – adaptation to the opponent. The atmosphere is excellent. Motivation is appropriate. The team is leading the championship, the changing in the rule of sending the referees does not affect the team negatively because the coach has a high degree of sports diplomacy, the team wins the championship.

Stage: Near to chaos (again) – Season 2009/10

There is a significant change in the coach's life: he has a new job and the old team members are no longer motivated. Some key players take advantage of success, transferring to other teams. This results in a drop at the tactical level. The coach leaves the team, no new young players arrive, a new coach is to be chosen. Return to the initial state.

CONCLUSION

Sport is not only a social phenomenon in our world but also a true bank of experiments in human behaviour. It provides an opportunity to study effectively and efficiently the effects of intensive change in complex life systems at many levels (psychological, social) [26]. On the

one hand, the study of complex systems in sport might lead to a better understanding of evolutionary processes, optimization of resource extraction/allocation, and economic transactions; strategies for economic and ecosystem resilience and sustainability [27]. Analysis of factors influencing performance, motivation and determination can often be understood through interactions (synergies) [8]. For example, a player's performance depends not only on his own knowledge, his team role but also on the state of the receiving environment.

The observed system undergoes many macro changes, see Figure 2. Because of the inefficiency, increasing tension forced the actors to change roles: From player to coach, as well as from individual player to team member role. Despite the initial stumbling block, the coach's experience grew, and the quality of the player's motivation improved. However, they did not consider that the opponent also learned their playing style, since they were built on simple elements from individual solutions. The breakthrough was finally brought by the evolution of team attributes. They were already able to adapt to the circumstances at the team level, to adapt to their opponents [28]. The collapse began on the one hand with the loss of motivation and became complete by an external factor. This could have been avoided so that a resource must be maintained to maintain development. For example: develop an assistant coach then team is not so dependent on one person.

In summary, studying the complex systems of sport can bring some specific and general benefits. On the one hand, it can help improve sports and human performance by creating new strategies for teams and coaches. Improved understanding of human social networks, including player psychological drivers and group participation; developing a policy of participation in sport and education of young people [29]. The principles governing these group interactions are expected to apply to other biological collectives, where dynamics derive from a mixture of competition and physical principles [1, 30, 31]. These include superorganisms such as ant colonies birds and penguins [14]. Because of the potential for obtaining rapid empirical feedback on formal models, the modelling of sport-related phenomena requires particular attention from the point of view of science and complex systems theory [30]. Sophisticated sciences can contribute to changing the mechanical view prevalent in sport and can usefully contribute to understanding complex systems.

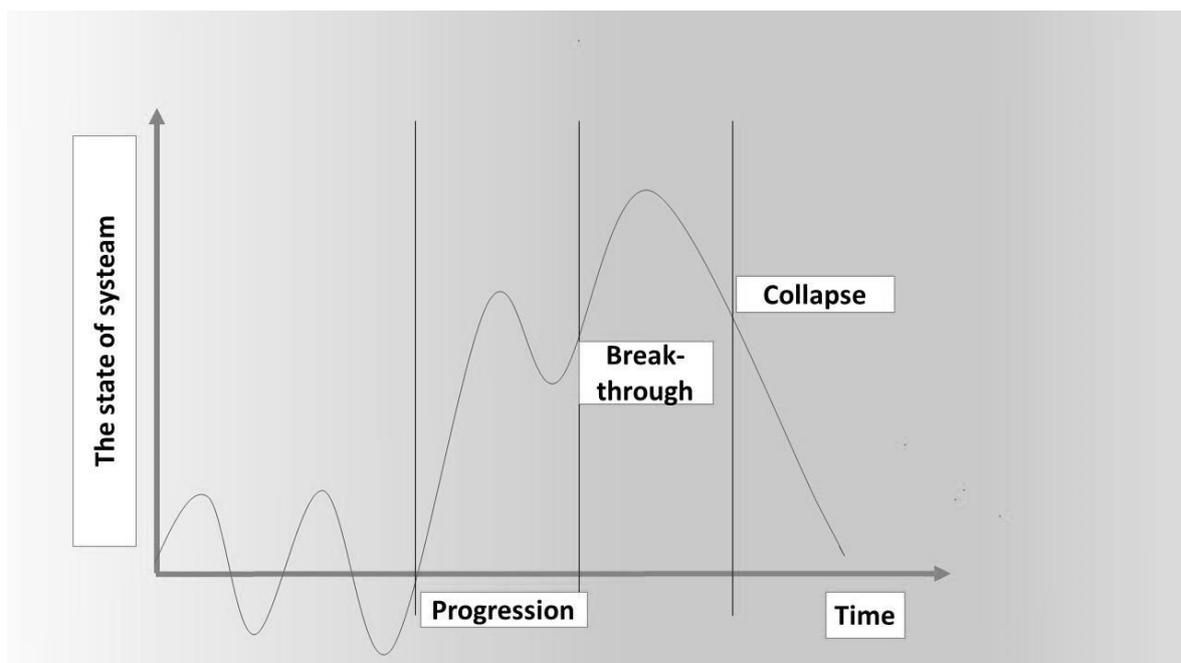


Figure 2. System macro changes (decreasing or increasing its performance).

LIMITATIONS AND FUTURE WORK

In this research, the development of only one team has monitored during the observed period. However carefully selected the parameters of the coach, the players and so on, some important attributes may have been missed depending on the special circumstances. In the future, this research would extend to more teams, other sports and more parameters. Future challenges include the influence of key control parameters on the non-linear behaviour of team-environment systems and the possible relationships between dynamics and constraints that affect team sports on different spatial-temporal scales.

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WHAT CAN GOOGLE TELL US ABOUT BITCOIN TRADING VOLUME IN CROATIA? EVIDENCE FROM THE ONLINE MARKETPLACE LOCALBITCOINS*

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ABSTRACT

Timely economic statistics is crucial for effective decision making. However, most of them are released with a lag. Thus, *nowcasting* has become widely popular in economics, and web search volume histories are already used to make predictions in various fields including IT, communications, medicine, health, business and economics. This article seeks to explore the potential of incorporating internet search data, in particular Google Trends data, in autoregressive models used to predict the volume of Bitcoin trading. Toda and Yamamoto procedure was applied in order to examine causality between Google search data and Bitcoin trading volume on the online marketplace LocalBitcoins, for the area of the Republic of Croatia. The results showed that internet search data can be useful for forecasting Bitcoin trading volume, since Google searches for the term “bitcoin” Granger causes Bitcoin trading volume in the online marketplace LocalBitcoins.

KEY WORDS

Bitcoin, Google Trends, Granger causality, Toda and Yamamoto approach

CLASSIFICATION

JEL: C1, E47

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INTRODUCTION

In the era of modern technology, the growing impact of digitization moves the classic trading model into the virtual world. Consequently, the need for alternative means of exchange arise. This is one of the cause of development, among others phenomena, of the cryptocurrencies, i.e. systems that use cryptography to allow the secure transfer and exchange of digital tokens in a distributed and decentralized manner. These tokens can be traded at market rates for fiat currencies. With the increasing informatization, massive new data sources resulting from human interaction with the internet offer a new perspective on the behavior of market participants in periods of large market movements [1]. These new data sources, such as Google Trends, gained substantial attention due to the ability to capture real-time online signals about consumer interest in a specific topic. A number of studies have examined how internet search data can be used to monitor various phenomena as they happen. This process is mostly described as “nowcasting”. Nowcasting is defined as the prediction of the present, the very near future and the very recent past [2]. The term is a contraction for *now* and *forecasting* and has been used for a long-time in meteorology and recently also in economics [3]. Nowcasting has become widely popular in economics, and web search volume histories are already used to make predictions in various fields including IT, communications, medicine, health, business and economics. Nowcasting is particularly relevant for those key macro economic variables which are collected at low frequency, typically on a quarterly basis, and released with a substantial lag [2]. Research using Google Trends has increased dramatically in the last decade, and in the process, the focus of research has shifted to forecasting changes, whereas in the past the focus had been on merely describing and diagnosing research trends, such as surveillance and monitoring [4]. It has been confirmed that Google search data constitute a reliable alternative when official data are lacking [5].

Although Google search data have been applied in wide range of areas and a number of articles have demonstrated the usefulness of Google trends, studies on the level of Croatia are lacking. Therefore, this article contributes to analyses of the utility of the Google search data on economic data, especially cryptocurrencies. The focus is placed on the analysis of the relationship of search data with the keyword “bitcoin” provided from Google Trends for the area of the Republic of Croatia, with the Bitcoin trading volume in Croatia in the LocalBitcoins marketplace. Causality test is based on the approach proposed by Toda and Yamamoto [6].

CRYPTOCURRENCY

Cryptocurrency is the name given to a system that uses cryptography to allow a secure transfer and exchange of digital tokens in a distributed and decentralized manner. These tokens can be traded at market rates for fiat currencies [7]. Cryptocurrencies are not real money, they represent an internet protocol through which is data transferred from one web-location to another. Every protocol has a purpose and a specified type of data which it transfers. The purpose of a protocol can be e.g. exchange for a fiat currency, the smart contract, exchange of data, etc. Unlike fiat currencies, cryptocurrencies are decentralized, meaning that there is no central authority which manages or issues them and their value is determined by their users.

Bitcoin is a Peer-to-Peer system based on complex cryptographic algorithms. Peer-to-Peer is a network where there is no central authority issuing new money or tracking transactions. The advantages of such a system are that it is possible to point out a simple transfer of money over the internet, without the intermediary, whereby a third party cannot prevent or manage

the user's transactions. There is no central bank in the Bitcoin system that issues money and keeps and processes transactions, nor does it have a unique owner of the Bitcoin network. The key difference of Bitcoin in relation to centralized systems comes from the fact that every user has access to their transactions and transactions of the other parties. Each transaction contains a digital signature of the user who started it [8]. The precision of this value limits the extent to which units of the currency can be subdivided; the smallest unit is called Satoshi. By convention, 10^8 Satoshi is considered the primary unit of currency, called one "Bitcoin" and denoted BTC or XBT [9].

Bitcoin is the first implementation of a concept called "cryptocurrency", which was first described in 1998 by Wei Dai on the Cypherpunks mailing list, suggesting the idea of a new form of money that uses cryptography to control its creation and transactions, rather than a central authority. The first Bitcoin specification and proof of concept was published in 2009 in a cryptography mailing list by Satoshi Nakamoto [10]. Bitcoin's genesis block was mined around January 3, 2009. The first use of Bitcoin as a currency is thought to be a transaction in May 2010, where one user ordered pizza delivery for another in exchange for 10 000 bitcoins [9]. Trading took off in 2011, when one bitcoin was worth about \$0,05. In early 2013, bitcoin peaked above \$200, only to drop back in value later on again. During the final months of 2013, the value increased to over \$1100 and dropped in the following months. During the early months of 2015, the value of bitcoin has been relatively stable between \$200 and \$300 and after rising since the end of 2015, the value rose above \$900 again [11]. The value began to grow steadily again in the year 2016. At the end of 2017, at one point, it reached the value of \$20 000.

The Bitcoin's success has ignited an exposition of new alternative crypto-currencies (*altcoins*); however, none of these have been able to jeopardize the Bitcoin's dominant role in the field [12]. Most of altcoins rely on the same or similar blockchain technology as Bitcoin, and aim to either complement or improve certain Bitcoin characteristics [13].

GOOGLE TRENDS

Google Trends is an online tool that provides their users to explore how frequently specific terms, phrases and topics are entered into Google's search engine relative to the site's total search volume over a specific time period and in a specific place (country or region). Varian and Choi (2009) emphasize that Google Trends data do not report the raw level of queries for a given search term, but a query index which starts with the query share: the total query volume for search term in a given geographic region divided by the total number of queries in that region at a point in time. The query share numbers are then normalized so that they start at 0 in January 1, 2004. Numbers at later dates indicated the percentage deviation from the query share on January 1, 2004 [14].

Search results are proportionate to the time and location of a query by the following process [14]:

- each data point is divided by the total searches of the geography and time range it represents to compare relative popularity. Otherwise, places with the most search volume would always be ranked highest,
- the resulting numbers are then scaled on a range of 0 to 100 based on a topic's proportion to all searches on all topics,
- different regions that show the same search interest for a term don't always have the same total search volumes.

The index value is based only on the share of search query volume. The total aggregated volume for a particular search query is obtained from a particular geographical area and scale ranges from 0 to 100, where 100 represents the top of the search or the highest possible

frequency and intensity of the search for a specific term that is being searched. The first step in the creating of the index is to calculate the ratio of new search queries and total search volume to get relative values. The values are then divided for each period with the highest relative value. The highest query number is assigned a value of 100, while the rest is divided proportionally. If the search query number is insufficient, the index value is zero.

Data that is excluded comprises [14]:

- searches made by very few people: Trends only shows data for popular terms, so search terms with low volume appear as “0”,
- duplicate searches; trends eliminates repeated searches from the same person over a short period of time,
- special characters; trends filters out queries with apostrophes and other special characters.

A number of studies have utilized search data to make predictions in various fields. Jun et al. [4] assert that Google Trends has become such a popular source for big data research and applications since it provides an excellent platform for observing consumers’ information seeking activities and offers instant reflection of the needs, wants, demands and interests of its users. Moreover, they emphasize that Google Trends is easy to use because Google not only collects data but also provides a variety of options for comparison. Varian and Choi [15] were one of the first authors who have demonstrated the potential of including internet search history data in different predictive models. They showed that Google Trends data can be helpful in improving forecasts of the current level of activity for a number of different economic time series, including automobile sales, home sales, retail sales, and travel behavior. Moreover, Google search data have been used as measure of investor attention. For instance, Da et al. [16] proposed a direct measure of investor attention using search frequency from Google that captures investor attention in a more timely fashion and can be helpful in predicting stock prices. A comprehensive analysis of the trends in research studies in the past decade which have utilized Google Trends, as a new source of big data, together with an overview of the studies that have used Google Trends can be found in [4].

RELATED RESEARCH

Given the current media attention focused on cryptocurrencies and the ability of the Google Trends online tool to explore the search for a particular key word, it is of interest to explore search terms related to cryptocurrencies, and especially Bitcoin. Such researches are not a novelty and authors have advocated the use of web search volume data to build prediction models. Liu and Tsyvinski [17] showed that cryptocurrencies have no exposure to most common stock markets and macroeconomic factors but in contrast, cryptocurrencies returns can be predicted by factors that are specific to cryptocurrency markets. They determined a strong time-series momentum effect and that proxies for investor attention strongly forecast cryptocurrency return. They constructed the deviation from Google searches for the word “Bitcoin”, “Ripple” and “Ethereum” in a given week compared to the average of those for the preceding weeks and showed that Google search volume can predict the future price movements. Kristoufek [18] studied the relationship between Bitcoin and search queries on Google Trends and Wikipedia, showing that search queries and prices are related with a pronounced asymmetry between the effect of an increased interest in the currency while being above or below its trend value. Matta et al. [19] compared trends of Bitcoin price and search queries on Google Trends, volume of tweets and particularly with those that express a positive sentiment. They found significant cross correlation values, especially between Bitcoin price and Google Trends data. The same group of authors [20] studied the existing relationship between Bitcoin’s trading volumes and the query volumes of Google search engine. They

achieved significant cross correlation values, demonstrating search volumes power to anticipate trading volumes of Bitcoin currency. Urquhart [21] employed Google trends as a proxy for investor attention and applied Granger causality tests to the data from period 2010 to 2017 restricted to the area of USA. The author concluded that previous day volume and volatility are significant drivers of attention of Bitcoin only in a subsample of data and that investors are attracted to Bitcoin after large increases in volatility and trading volume.

METHODS AND PROCEDURES

The analysis has been performed within a timeframe of 200 weeks. Weekly data have been collected in the period from the beginning of 2014 till the end of October 2017.

The analysis was performed on log-transformed data, rather than the original series. Toda-Yamamoto [6] procedure was performed. According to Toda and Yamamoto [6], if one of the time series used in analysis is non-stationary, the model can be estimated with variables in levels, but an extra lag of integration must be added. That extra lag is later ignored by conducting the Wald test, where the test statistics follows the usual asymptotic χ^2 distribution under the null hypothesis.

As already stated, the Toda and Yamamoto approach refers to causality testing in the presence of nonstationary variables. They propose to estimate an augmented VAR model to correct for the observed unit roots. In the bivariate case considered in this article, the VAR setup has the following form [6, 22]:

$$x_t = a_1 + \sum_{i=1}^{p+1} \beta_{1,i} x_{t-i} + \sum_{j=1}^{p+1} \gamma_{1,j} y_{t-j} + \varepsilon_{1,t}, \quad (1)$$

$$y_t = a_2 + \sum_{i=1}^{p+1} \beta_{2,i} y_{t-i} + \sum_{j=1}^{p+1} \gamma_{2,j} x_{t-j} + \varepsilon_{2,t}, \quad (2)$$

where p is the optimal lag order chosen by information criteria (e.g. AIC, SC, HQ), a_1 and a_2 are constant terms, β_{1i} and β_{2i} are autoregressive parameters, while ε_1 and ε_2 are white-noise (mutually uncorrelated) error terms. Furthermore, x_t represents the logarithm of search volume of keyword “bitcoin”, while y_t represents the logarithm of trading volume of bitcoin (BTC) (in HRK equivalent) on the online market LocalBitcoins. Generally, if d is the maximum order of integration of the observed time series, the VAR setup is of the following form:

$$x_t = a_1 + \sum_{i=1}^{p+d} \beta_{1,i} x_{t-i} + \sum_{j=1}^{p+d} \gamma_{1,j} y_{t-j} + \varepsilon_{1,t}, \quad (3)$$

$$y_t = a_2 + \sum_{i=1}^{p+d} \beta_{2,i} y_{t-i} + \sum_{j=1}^{p+d} \gamma_{2,j} x_{t-j} + \varepsilon_{2,t}, \quad (4)$$

The causality testing procedure within the Toda and Yamamoto approach comes down to testing the following null hypotheses:

$$\mathbf{H}_0: y \text{ does not Granger cause } x (\gamma_{1,1} = \gamma_{1,2} = \dots = \gamma_{1,p} = 0),$$

$$\mathbf{H}_0: x \text{ does not Granger cause } y (\gamma_{2,1} = \gamma_{2,2} = \dots = \gamma_{2,p} = 0).$$

RESULTS

The log-transformed time series are presented in Figure 1. The Bitcoin trading volume data are provided from LocalBitcoins trading site where people from different countries can exchange their local currency to bitcoins [23].

Stationarity and the maximum level of integration of the Bitcoin volume and Google Trend data was tested for each time series with Augmented Dickey-Fuller (ADF) test and Kwiatkowski-Phillips-Schmidt-Shin test (KPSS). The combination of these two tests is convenient since they have opposite null-hypotheses. The results suggest that Bitcoin volume is non-stationary (ADF = -2,19, $p = 0,5$; KPSS = 3,79, $p < 0,01$), while the analysis of the first

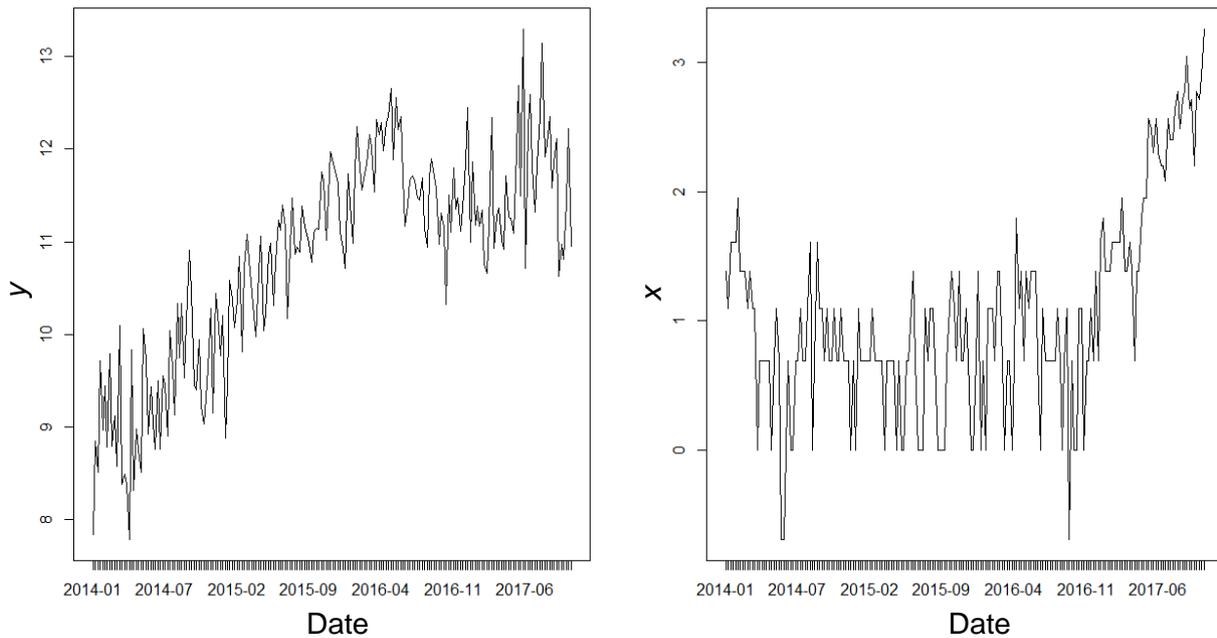


Figure 1. Bitcoin trading volume (left) and search queries (right) evolution.

differences suggests that the process of first differences is a stationary process (KPSS = 0,04675; $p > 0,1$; ADF = $-7,1031$; $p < 0,01$), so we can conclude that Bitcoin contains the unit-root. Also, results suggest that Google Trend is non-stationary (ADF = $-3,1439$, $p = 0,099$; KPSS = 0,96, $p > 0,01$), while the process of first differences is stationary (ADF = $-7,6428$; $p = 0,01$; KPSS = 0,0641; $p > 0,1$). Consequently, Google Trend contains the unit-root.

Appropriate lag order of the VAR model was determined using lag-length selection criteria. Several measures were used to determine the appropriate lag order of the VAR model: Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Final Prediction Error (FPE) and Hannan-Quinn (HQ) Information Criteria. According to the SC and HQ criteria, the optimal lag order was $k = 3$, while the AIC, LR and FPE criteria suggested $k = 5$. VAR was estimated with lag order $k = 3$ and $k = 5$. Results of the autocorrelation error tests for the VAR model with $k = 3$ suggested the existence of autocorrelation errors, so the model with the lag order $k = 5$ was analysed. The results are summarized in Table 1.

The results of the autocorrelation analysis of the residuals indicated that there is no problem of autocorrelation of residuals. Also, the model satisfies the stability conditions.

Table 1. Lag-length selection criteria.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-414,0024	NA	0,408968	4,781636	4,817947	4,796366
1	-290,1860	243,3632	0,103177	3,404437	3,513370	3,448627
2	-264,7448	49,42027	0,080642	3,157986	3,339541	3,231636
3	-250,3882	27,55808	0,071596	3,038945	3,293122*	3,142055*
4	-244,2613	11,62005	0,069873	3,014497	3,341296	3,147067
5	-238,4114	10,96001*	0,068414*	2,993235*	3,392656	3,155265
6	-238,1010	0,574545	0,071393	3,035643	3,507686	3,227133
7	-233,4411	8,516240	0,070875	3,028059	3,572724	3,249009
8	-229,9509	6,298439	0,071320	3,033919	3,651205	3,284328

*selected lag order by the criterion

The results for the causality testing procedure within the Toda and Yamamoto approach are summarised in Table 2.

Table 2. Causality test results.

Dependent variable	χ^2	Probability
y	4,4245	0,4900
x	18,8567	0,0020

Based on the causality test results it can be concluded that *x* Granger causes *y*, but not vice-versa.

CONCLUSION AND DISCUSSION

Cryptocurrencies, such as Bitcoin, Ethereum and Ripple, can be regarded as a new asset class, a fully digital, sui-generis financial instruments but allocating capital into cryptocurrencies remains in the domain of pure speculation due to their strong volatility [24]. Therefore, due to their rapidly increasing and very volatile exchange rate, cryptocurrencies have been a lightning rod of interest for millions of people. Today bitcoin is one of the most trending topics on search engines and social media. In recent years, the availability and the timeliness of internet search data have encouraged researchers from various fields to employ these kind of big data sources in order to build different prediction models.

Research have revealed that Google search data can be used as a proxy for investor attention in different markets. Moreover, search data are able to capture investor attention in a more timely fashion and thus can be helpful in building prediction models. This is also especially beneficial for cryptocurrency market which is highly influenced by news, technological development, various social and government factors and factors that are specific to cryptocurrency markets.

The purpose of this study was to examine whether the information extracted by web search media could be helpful and used by investment professionals in Bitcoin limited to the area of Republic of Croatia. We analyzed query volume search of “bitcoin” keyword on the online platform Google Trends and the volume of Bitcoin trading in the online marketplace LocalBitcoins, restricted to the area of the Republic of Croatia within a timeframe of 200 weeks. Due to non-stationary variables included in the analysis, causality was tested by applying Toda and Yamamoto approach. The results confirmed that query volumes of Google search engine have a significant causal effect on Bitcoin trading volume. Similar results were reported by various research, using data not restricted to a specific area.

Moreover, information available on social media satisfies one of the basic principles of nowcasting – promptly exploitation of information. This kind of information can be relevant for building prediction models in cryptocurrency market and already has been used as a strong measure of investor attention. Different forms of social media, such as discussion forums, apps and web-sites, can provide a goldmine of information. For instance, user comments and replies in online cryptocurrency communities proved to affect the number of transactions among users [25] while it is demonstrated that the number of tweets from Twitter is a significant driver of next day trading volume and realized volatility [26]. Due to the fact that research have already shown that social media signals can be used as a stronger measure of investor attention, we believe that incorporating data collected from social media could be helpful in building prediction models. Thus, today, challenges grow from not only using internet search data for prediction purposes but also combining them with other sources of big data. Being accurate, able to collect big data and releasing reliable information for free, we believe that Google Trends will continue to have a growing impact in the future.

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THE DANGER OF USING ARTIFICIAL INTELLIGENCE IN DEVELOPMENT OF AUTONOMOUS VEHICLES

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ABSTRACT

The world of autonomous vehicles approaches as technology evolves. Researches have been done, development has been made in several countries, car manufacturers have already marketed their semi-self-driven automobiles. Nowadays artificial intelligence is present across nearly all industries due to scientific achievements in the field of artificial neural networks [1], computer vision [2], and a multi-layer neural network [3]. Utilizing AI for developing autonomous vehicles has been an obvious choice as making decisions based on continuously flowing vast amount of information from different sensors requires fast processing. In case of industrial AI where decision making is based on video image analysing, false decisions can lead to categorizing either flawless products as faulty or wrong products as good. In case of human politics when artificial intelligence is used to determine tender winners, making the wrong call could only mean gender biased results [4]. However in case of self-driven cars making bad decision might equal causing accidents and endangering people's lives, such as it happened to Uber [5]. Scientists at MIT successfully developed the World's first psychopath AI, which achievement claimed the responsibility of educating non-natural minds [6]. The aim of this article is to point out those situations and scenarios in which self-driven cars could be hijacked, misguided, captured, or even influenced to turn against other vehicles.

KEY WORDS

autonomous vehicle, hijacking, capture, cheat, candidate AI

CLASSIFICATION

JEL: O33

INTRODUCTION

The topic of self-driven cars has recently become popular, although the idea has a long history. Radio-controlled cars existed in 1925. The Chrysler Imperial was capable of cruise controlling in 1958. In 1995 Mercedes developed an almost fully autonomous car that travelled 2 000 km, but had room for only one person, the driver due to the multiple electronic devices the task needed. Google started its self-driven car project in 2009. Tesla's Autopilot software has been available since 2015 and has been updated ever since. Japan plans to transport the visitors of the 2020 Olympic Games only by using autonomous taxis [7]. As of now various car manufacturers provide partially self-driven cars, and self-driven vehicles are present in fixed path public transportation (trams and metros) in metropolises. Self-driven cars are in plan to enter traffic within ten years of time, meanwhile Tesla's strategy announced two years.

The expectation of spreading self-driven cars lies in the hope of significantly decreasing the 1,3 million death toll accidents world-wide, which are caused by human factor 90 % of the time. In policies of insurance companies the reaction time of a human realizing any dangerous situation, reacting to it and putting the breaks into action is two seconds. The reaction time would be reduced by the power of AI since it can process a huge amount of data coming from sensors and, with information corresponding to the situation, could make decision much faster than humans.

Until the end of November 2018 Tesla cars travelled one billion miles in self-driven mode using the Autopilot software which was issued in 2015. The mileage is five times of the Sun-Earth distance. The accidents statistics of the journey showed one accident or accident-like incident every 3,34 million miles. According to the US Department of Transportation there is an accident every 492 000 miles in America, making the self-driven mode seven times safer [8].

The aim of this article is to discuss situations and scenarios when artificial intelligence of vehicles could be confused or influenced to make bad decisions endangering passengers' lives.

SAE LEVELS

The Society of Automotive Engineers (SAE) determines the intelligence level and automation capabilities of vehicles on six levels, from 0 to 5. On level 0 there is no automation, fully manual vehicles belong in the category. Level 1 is the lowest level of automation with only one automated function, like steering, speeding or braking control, most cars of our days belong to this category. Level 2 vehicles are capable of automated steering and acceleration and may be capable of self-driving in zero-traffic environment, with clearly visible lane painting, although the driver has to indicate all times readiness of taking control (e.g. by touching the steering wheel). Level 3 cars can detect environment and travel in self-driving mode for a longer amount of time, but in case of any problem, they stop and give the control back to the driver, which might cause further problems under certain circumstances like in the inner lane of highways.

The key difference between level 3 and level 4 automation is that level 4 vehicles are able to intervene themselves if things go wrong or there is a system failure. In this sense, these cars are left completely to their own devices without any human intervention in the vast majority of situations, although the option to manually override does remain in difficult or preferable circumstances. Level 5 cars must be able to take passengers to their destination fully self-driven taking care of all problems occurring during journey. Car manufacturers build redundant systems in order to avoid malfunctions [9].

EDUCATION OF ARTIFICIAL INTELLIGENCE IN AUTONOMOUS VEHICLES

Thanks to the most recent findings and results, it is an obvious choice to develop artificial intelligence for self-driving cars to meet the quality and time requirements of decision making in as complex situations as being in traffic. The requirement is processing the data coming from sensors and cameras and having a decision made under the thirtieth of a second.

When teaching the AI the simplest would be to only focus on traffic rules before decision. It would be also more simple from the perspective of the law in case of any accident. But being in traffic is not simple.

Engineers at Tesla have developed a shadow mode for the Autopilot software. In shadow mode the system monitors the drivers' actions and sends the information to the central database for further development. The idea is based on the notion that experienced drivers are capable of deviating from dangerous situations instantly. Although gathering data from vast number of unexperienced drivers might cause problems.

Various target hardware is present in vehicles. One of the most novel developments for teaching self-driving cars comes from NVIDIA. This tool creates a lifelike, detailed, interactive world that is not only for gaming but is useful for AI education purposes as well [10].

Hyundai CRADLE invested into the start-up, Perceptive Automata whose product observes the behaviour of pedestrians and tries to estimate the behavioural outcomes, such as the possibility of pedestrians changing their minds while crossing intersections letting autonomous cars cross first [11].

During the transitional period switching to self-driven cars from human-driven ones, recognizing insecure driving behaviour may be a key feature. Drivers with years of experience in traffic can recognize insecure chauffeurs instinctively. If drivers show shaky control over their cars in front of experienced drivers, the latter ones will either overtake them or will tail away to avoid getting into risky situations. The AI of autonomous vehicles might be trained to do so as well.

SITUATIONS TO SCAM SELF-DRIVEN CARS

There is no perfectly secured system, there will be no 100 % safe solution for self-driven cars either. S. Chen, the head of BlackBerry, has claimed that his company will be able to provide 90 % security for the systems of autonomous vehicles, although the system must be monitored at all times from the moment of first usage [12].

This article focuses on situations that can confuse or scam self-driven cars, and does not focus on analysing how to hack artificial intelligence of vehicles instead. The aim has been to convince automobile manufacturers to test their products for these possible scenarios, for a more safe traffic environment dominated by autonomous vehicles.

THE DANGERS OF CHANGES IN HUMAN BEHAVIOR

Artificial intelligence will be much faster processing and responding to traffic situations providing a safer solution for driving. In the proximity of autonomous vehicles, using their shortened reaction time, drivers in human driven cars might abuse it to their advantage. Drivers might cut in lane in front of self-driven cars, forcing it to use the break, or driving their cars into intersections relying on the approaching self-driven car's software to stop, or enrolling in-front of them at highway entrances, etc.

Traffic might slow down because of these probable scenarios. There might also happen accidents caused during the transitioning era if a human driven car abuses the shortened

reaction time of a self-driven one followed by a human driven car, which needs larger time to react. It also holds the possibility of planned accidents caused by human driven cars targeting the other human driven car following a self-driven one.

FAKE ROAD SIGNS

Modern cars have program for road sign identification, then show it to the driver on dashboard or windshield. This warns driver for speeding, restriction of parking, etc. Research had been made at Princeton University about fooling of this system and it had 90 % success of attacks, which could aware on interesting situations [13]. Why is it possible? Just in the European Union use we different road signs with different colours with same meaning. [14]. For example, we can change a “Road closed to all vehicles in both directions” sign to a “Maximum speed limit 50” in the city for make an accident, see Figure 1.

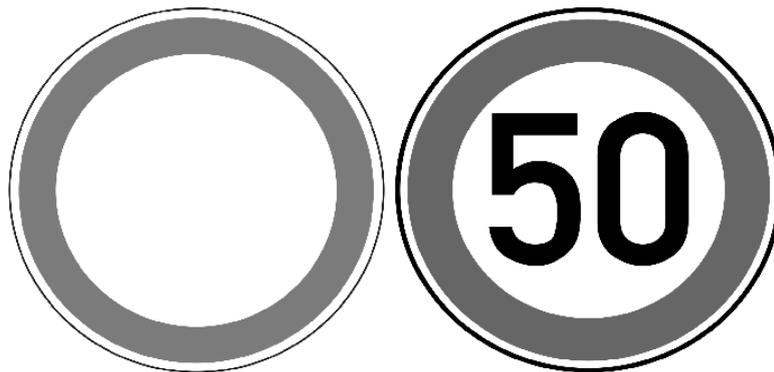


Fig. 1. Fake road signs.

Another example: one can change a “ Maximum speed limit 130” sign on the highway to a “Road closed to all vehicles in both directions” by covering the numbers, thus causing a traffic jam. As what road sign will the system interpret that case? Map of the vehicle knows the original meaning but detected data should have higher priority at decision making, which is good at road works, but generates insecurity in this case. Moreover, if a printed sign (for example on paper) is placed irregularly it can force autonomous cars to change their driving direction. That can occur with an entering restriction sign forcing the cars to choose different way. Capturing is a possibility by this, because one can have signs placed on both roads, or one can create rush if the two-way traffic is let on a one-way street. Somewhat more advanced possibility is to project a tri-dimensional sign using a LED projector. Would a system identify it as a road sign, or not?

FAKE LANE

Tracking system is already able to keep vehicle in the middle of the lane, if paint and visibility are adequate. If these terms are no longer adequate, a sign appears for the driver to take care from now on. *Digital Light* technology was developed by Mercedes and it uses one million mirrors in both reflectors to works as a HD resolution projector. This device can enlighten onwards and it can also project symbols or lanes (Figure 2) like a same technology. Does this technology make possible deceiving a vehicle behind to follow the fake lane projected directly in front of it? This could cause a voluntary accident or could send an autonomous vehicle to a predetermined location.

Sensors can be bothered in a much simpler way, if we cover, plaster or paint them while parking at parking lot. This makes a vehicle spastic, because it would not get data from sensors thereby wasting time of its passengers. Consequently that bounds their freedom to places where travelling is only possible by car because of the distances covered.



Figure 2. Fake lanes.

CANDIDATE AI

Apparently, usage of artificial intelligence is spreading among developer companies, because it can be a better solution for self-driving as earlier methods like, the continually learning system of Tesla. Artificial intelligence based system is a hard challenge for developers, because it must be prepared for and taught to every possibly situations and avoiding its dangers. This teaching method makes a difference. Researcher of MIT in 2018 presented a psychopath AI, called Norman [6]. Norman took a Rorschach test just as a simple AI [15], to allow analysing differences between their answers, what do they see in inkblots, to highlight the importance of teaching method in decision making of AI [16]. Study of MIT researcher shows that an AI could be made with killing functions like, “Christine” in the book of S. King [17]. In the world of autonomous vehicles this fact could be very important. Take an example of Tesla in June 2018, one malcontent staffer was enough to make trouble [18]. Of course, an evil car would be caught during a long testing period, but the plan could succeed, if it would base on the idea of the movie *The Manchurian Candidate* [19]. In this case, the killing function would link with a look of rare road sign, rare situation in traffic, a song from the radio, etc. This object could activate malice and change protecting functions to attacking, that could create an accident, injury or a terror event and an investigation needs long time to find out and then recall all Candidate AI. The investigation could be make more difficult, if killing function activates at the sign but acts only a random time or distance later, so all situations would be different. This would delay the detection, but the Manchurian AI could not be used for mass destruction.

CONSLUSION

Various scenarios and situations have been mentioned that could scam self-driven cars or confuse the AI to make the wrong decision. Educating the artificial intelligence is crucial, validating raw data and data protection must be taken into consideration. We counted a lot of situations, where it is worthy to prepare the systems for. A pretended, or even an incidental case can bring about the situation for which the system is not prepared, and which it could not treat properly. An autonomous vehicle must be aware to problems of the mentioned situations.

ACKNOWLEDGMENTS

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INDIGENOUS KNOWLEDGE FOR RESILIENCE AND ADAPTATION IN PASTORAL PRODUCTION SYSTEM OF SOMALI REGIONAL STATE IN ETHIOPIA

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ABSTRACT

The study attempts to highlight the importance and opportunities of indigenous knowledge for resilience and adaptation of the pastoral production system in the Sheygosh woreda of Somali region of Ethiopia. The study used data from primary and secondary sources. The primary data collected through key informants, focus group discussions, observations, ranking, and life history. The study highlights the fact that indigenous knowledge for resilience and adaptation contributes to reducing of vulnerability results from climate variability and also plays a critical role in adaptation, mitigation and coping with hazards and shocks in the past time. However, due to recurrent hazards and prolonged shocks and climate change, the use of traditional knowledge of coping mechanisms are under tremendous threats and will not be viable and sustainable in the coming years. In conclusion, the indigenous knowledge in the pastoral community deserves to recognize and support in view of their coping with, adapting to and withstand to hazard and climate chance. Thus, it needs to integrate in policies of the country.

KEY WORDS

indigenous knowledge, resilience, adaptation, pastoral, production system, Ethiopia

CLASSIFICATION

JEL: Q15, Q56, R14

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BACKGROUND AND JUSTIFICATION

Pastoralism system is and has been practiced in many regions of the world for centuries [1], and plays a significant role in conserving of natural and environmental capital [2]. According to [3], it is widely accepted that livestock production system is a rational economic enterprise in the pastoral communities.

Worldwide, pastoralism supports about 200 million households and herds of nearly about a billion head of animals such as goats, cattle and camels [4] and occupies a quarter of the world's land area which is predominantly arid and semi-arid lands and supports millions of pastoral households in which 60 % are living in Africa [5, 6].

According to CSA projection population [7], Ethiopia is the second most populous country in Africa, and one of the continent's largest areas. Ethiopia has the largest livestock population in Africa [8, 9]. Based on livestock and livestock characteristics assessment carried out by CSA in mid-2014/2015, this sector substantially has been contributing the economic development of the country in both products and by-products forms. According to Mulu [10], pastoral areas in Ethiopia covers more than 62 % of the country's land mass. As S. Desta [6] pointed out, that means that two thirds of the land mass of the country support 12-15 % of the country's human population. However, this area with livelihood system has been faced a continuous drought, conflict and famine for the last decades [11].

In this regard, the Ethiopian government has initiated several developmental projects in the pastoral areas to address pastoral problems which adversely effects on growth and economic development of the country. These projects include Pastoral Forum of Ethiopia (PFE) et al. [12], South East Rangeland Project (SERP), Pastoral Pilot Project, Pastoral safety net Programme (PSNP), Pastoral community Development Project (PCDP) and others implemented by NGO's such as Pastoral Livelihoods Initiative (PLI) I and II, Revitalizing Agricultural/Pastoral Incomes and New Markets (RAIN), Pastoralists Areas Resilience Improvement through Market Expansion (PRIMA) and so on were directly concentrated on two key pillars of disaster risk reduction fundamentals, namely minimizing of vulnerability of pastoral communities and maximizing of resilience and adaptive capacity to hazards and climate variability.

Despite enormous efforts exerted towards improving the pastoral livelihoods as a vital system in the drylands of Africa in general and particular in Ethiopia, the outcomes of these program/projects as Hogg [13], pointed out was insignificant and little have done to increase livestock production and productivity or to change the quality standard of pastoral peoples. Several reasons have been pinpointed for this poor performance, include neglecting of the indigenous knowledge, socio-cultural and ecological aspects of the pastoralist, ignoring of indigenous social structure and low level of participation of local knowledge in their design [13, 14].

Nevertheless, it is time to invest in pastoral production system reasonable manner – in terms of research, and financial – in order to reduce vulnerability to hazards, climate variability and other external human-induced disasters, and to enable the pastoral production system to be a more productive system and sustainable livelihood. The study, thus, examines indigenous knowledge and its role in building of risk minimization strategies.

CONCEPTUAL FRAMEWORK OF THE STUDY

The conceptual framework is the system of collective concepts, assumptions, expectations, beliefs, and theories that support and guide the research goals and it can be a graphic or in narrative form. Based on that, the conceptual framework of this study is based on the ideas of resilience and adaptation theory with additional input from Sustainable Livelihood Approach,

as Figure 1 shows. The ongoing discussion on climate changes and hazards of the pastoral traditional system is also considered. Therefore, the conceptual framework of the study attempts to connect to all aspects of inquiry include problem and questions, purpose, literature review, methodology, data collection and analysis.

The conceptual framework indicates that the pastoral traditional system has characteristics and opportunities for the sustained livelihood in their livelihood system, including resilience, adaptive capacity to hazards and coping mechanism with their environment. At the same time there are internal and external threats to the persistent of pastoral production system. These factors are mainly vulnerability factors and risks elements of the pastoral production system, notably social network aspects and social protection supports, economic and political dimensions, and ecosystem and environments.

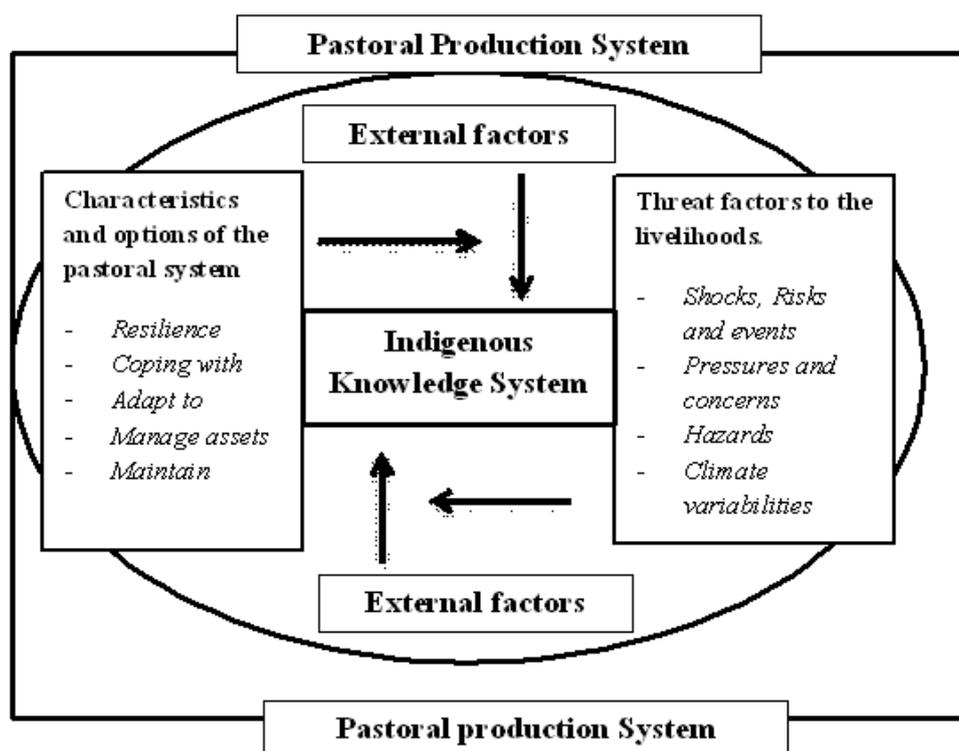


Figure 1. Conceptual framework of the study.

DESCRIPTION OF THE STUDY AREA

The Somali Regional State (SRS) is one of the nine regional states of the Federal Democratic Republic of Ethiopia (FDRE). Geographically, SRS is the second largest in the country. It covers a total area of 350 000 km². According to the last Population and Housing Censuses in 2007, the regions' population is estimated about 4 439 147 million [9]. In 2013 an unofficial projected population census produced by regional Bureau of Finance and Economic Development (BoFED), the population of the region is projected about 5,3 million. The region has 9 administrative zones which encompass up to 68 districts and four administrative towns or councils and more than 780 centres/*kebeles* [14]. It borders Djibouti to the north; Somalia to the east and northeast; Kenya to the south; Oromiya Region to the west and Afar Region in the north-west, Figure 2.

METHODS OF DATA COLLECTING

The study attempts to employ one of the most effective methods for information gathering from the community those deemed to have enough knowledge about what the study attempts

to address. The method for data collection includes a gender responsive participatory approach based on the understanding that men and women have different indigenous knowledge regarding to their locality context. The study used primary data collection such as 3 Focus Group Discussion; 4 Key informant interviews including government staffs, and women and youth offices and direct observation. Also the study used secondary data collection, such as, from available documents, books, journals, official reports, e-books and all possible knowledge sources and hubs.

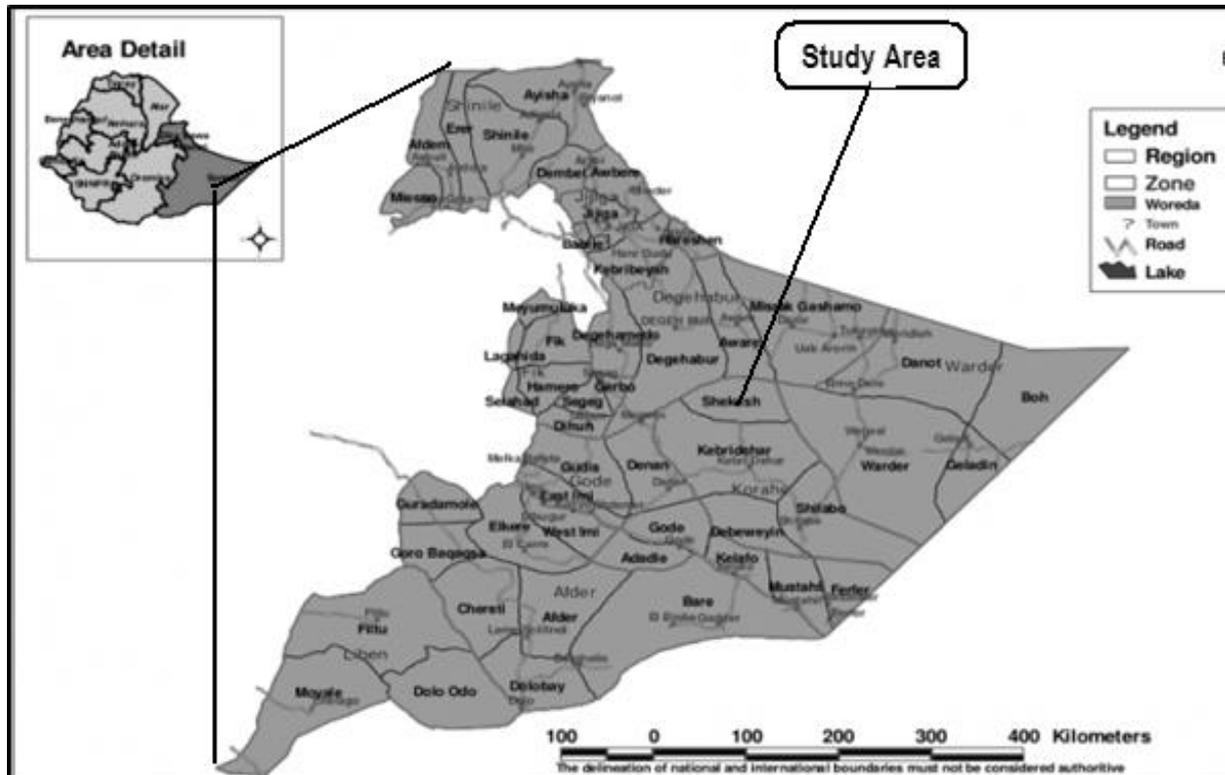


Figure 2. Map of the study area [14].

DATA SAMPLING TECHNIQUES

The study uses qualitative methods to answer the questions of the study pertinent to what, why and how, in understanding of human behaviour, opinions and experiences, they have or practiced in his environment. Sampling selection of the study uses is a purposive sampling method. The rationale behind or using this method is to interview a knowledgeable and competent traditional elder who have the required criteria according the study approach. Therefore, the case study was conducted in purposively selected Sheygoosh *woreda* and four *kebeles* namely, Raad dooyo, maro-guduudsi, *kebele* 10 and *kebele* 02 from Sheygoosh *woreda*. The *woreda* is predominantly pastoralist, but due to recurrent hazards the *woreda* has recently become agro-pastoralist livelihood.

In this case, the study systematically employs a number of techniques including Participatory Rural Appraisal (PRA), because the growth of PRA as a technique has seen a proliferation in social research of its application and use.

METHODS OF DATA ANALYSIS

Data analysis and process starts by understanding and describing the overall situation. In order to analyse the data collected from field appropriate methods, instruments and procedures used. A qualitative data analysis method used to analyse the data. From the

qualitative data analysis methods thematic and content based techniques also used. Finally, all data obtained from documents, interviews and questionnaires triangulated in order to properly answer the essential research questions and postulates proposed by the study.

RESULTS AND DISCUSSION

PASTORAL PRODUCTION SYSTEM IN SHEYGOSH WOREDA

Pastoralist production system everywhere on the earth their live heavily derive from livestock products and by-products by consumption or by sales [15]. In Ethiopia, livestock production is the main source and asset of the income for pastoralists and agro-pastoralists, also the sector considerably contribute to the country's GDP [16, 17].

Somali Region has the largest area and the most population of Ethiopia's dry land pastoral area [18]. Livestock production sales constitutes up to 50 % or more of all their income. Population of the region is categorized into a pastoralist which is majority, agro-pastoralists, pure farmers, and about 14 % of urban population [19]. The region has about 17 food economy zones or livelihoods system. Among of these, eight are categorized as a pure pastoralist, whereas six are agro-pastoralist and only three are pure agricultural [18]. Livelihood based-livestock rearing is the dominant way of life of Somali region pastoralist. Livestock production system is the mainstay of pastoralists' livelihoods throughout the region.

Pastoralists of the Somali regional locate in dry land and harsh environment characterized by water shortage and pasture due to recurrent droughts, land degradation, other human-induced shocks. In turn, the pastoralist production system in the region becomes increasingly vulnerable to hazards and gradually loses its resilient and adaptive capacity of the traditional pastoral system.

The livelihood transforming has triggered the trend of hazards and shocks in the *woreda*, which generates a number of unwilling options of livelihoods. The livelihood systems in which people in the *woreda* depend as group discussants confirmed are traditional pastoral production system, agro-pastoralist, petty trades, daily labour and others (temporary work).

The pastoralist in the *woreda* depends on two types of livestock production. First type comprises products and by-products such as milk, meat, cheese, and butter supply to the local market on weekly or daily basis. The second type is livestock itself; sale animals, hides and skin through local market on a need basis.

According to the agro-pastoralists or semi-sedentary, they derive their livelihood from animal products and by-products (at low level) and partially from farming system which is rain-fed system. However, as Figure 3 indicates, about 75 % of the majority people of Sheygosha *woreda* depend on livestock production system, while sizeable numbers 15 % of population is agro-pastoralist. About 10 % are deriving their income through daily labour, such as construction activities, donkey cart and other daily activities. The majority of this group are ex-pastoralists or drop-out pastoralists, those who lost their assets and property and subsequently migrated to the villages and towns. Only 2 % are engaging in trade and business related activities, such as food staple, clothes, normal shopping, restaurant, *chat* and other private activities, while 3 % work in temporary and occasional opportunities including trees cutting and wood collection, charcoal burning etc.

CHALLENGES OF PASTORAL PRODUCTION SYSTEM

Pastoral production was an oldest livelihood and overriding system which Somali community depends on it a long period of time. As focus group discussants confirmed, this system was traditionally strong and manageable and people were genuinely proud for being pastoralists. However, currently the traditional pastoral system practicing is declining and gradually losing

Livelihood types and income sources

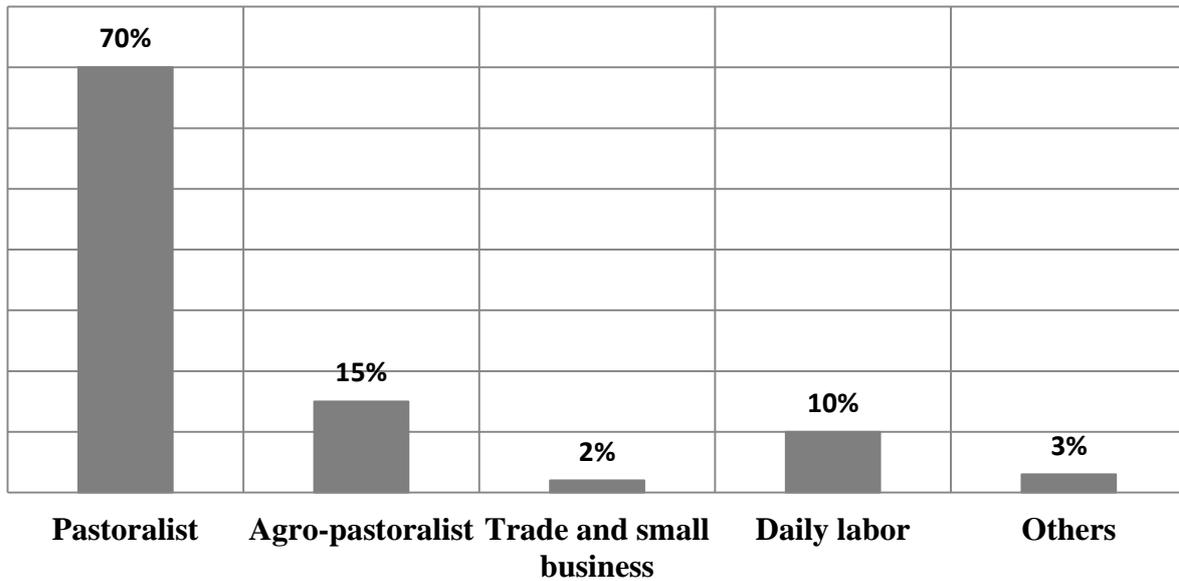


Figure 3. Livelihood types and income sources. Source: Focus Group Discussions.

its cherished possession. Several reasons attributed by community to the underlining causes of decreasing of practicing of pastoral production system. The main roots of challenges is summarised further in the text.

Recurring Drought: Drought in the pastoral area is a climatic-phenomenon. According to key informants and experts, the drought trend of severity and frequency is doubled recent years. As a result, drought has adversely affected on the pastoralist production system by disrupting income source, trade and value chain, social structure network and valued norms, ecosystem and natural resources and overall of livestock production and by-products. A number of studies conducted showed the significant impact of drought on the livestock production system in lowland. Their findings revealed that during drought livestock population and production had decreased dramatically (Fasil et al. as cited in [20]).

Disclose new alternative of livelihoods: Somali pastoralists dating were professionally practicing the pastoral system dating back thousands of years. This system was the dominant livelihood in region's inhabitant. However, the respondents observed that due to the recurrent and prolonged hazards people attempt to look for another livelihood option which is better and more sustained rather than fragile pastoral system. Among of them had introduced a mixed system namely, agro-pastoralist, petty trade and other activities. All these new alternative activities reduced partially pure pastoral production system.

Better education for children: The number size of pastoralist family is a considerable important, even in some parts the big family is considered as a part of wealth characteristics. Although the pastoralists have an old system of learning of children for Koranic education and other Islamic teachings *duksis*, which is based on mobile schools, but when government has introduced informal and formal education in the pastoral areas such as alternative basic education (ABE) and mobile education, it has changed their perception toward the role of education. Based on that, pastoralist households those have sizeable number of children, splits into two; some of them send to their relatives in towns in order to obtain formal education, and some of them remain with family to care take animals.

Restriction of movement and mobility: The most important mechanism of pastoralists is the mobility both during dry and rain seasons. The mobility meant to the pastoral context a search of pasture and adequate water for their animals and trade and food supply for human. However, any restriction action and limitation of pastoralists' movement is heavily paralyzing of their livelihood and food security. The major restrictions that pastoralist complaint includes, livestock trade cross border, which government labelled an illegal trade or contraband action, rangeland degradation by the name of exploration /investments, increased sedentarisation due to proliferation and investing of huge dams and water catchments in rangelands and security restriction. All these factors and others not mentioned here have triggered the weakness of the pastoral production system.

Migration from rural to urban area: Migration from rural is a new phenomenon relatively in the pastoral area. This phenomenon span is about a decade. Many factors underlining the migration include, looking a better life, distraction, security aspects, family conflicts etc. However, the majority of these migrants is young generation and is considered the mainstay of households. The migration of this category of generation is indication of desperation and the beginning of the end of collapsing of pastoralist household structure.

Low basic service delivery and social protection: The frequent drought and shocks in the pastoral areas forced to the pastoralists to be a more reliant on government and NGO supports. However, although many basic services and social protection projects and programs have been implemented in a vast area of pastoralist localities, still the pastoralists claims more to do in safeguarding of their assets and livelihoods in the face of the climate variability.

Moderation and change of mindsets: Though the pastoral production system is an old livelihood system based on strong values and traditional norms, but many pastoralists start to change their attitude towards this livelihood system, thinking that pastoralists is a backward system not compatible with the new life and the sophisticated civilization. Eventually, they categorized the pastoralists' community as a backwardness society. And they believe pastoral production system is taboo issue and people exclude them from the existence.

Increase of bad habits which are an exotic in Somalis pastoralist values and norms: The proximity between urban and rural communities generates a number of interactions and sharing of values, whether it is a bad habit or a good conduct. It was observed that many male pastoralists (at all levels) chew *Khat (Catha edulis)* and smoke cigarettes. These two habits were unusual in the pastoralist communities. However, practicing these bad habits on a daily basis (addictions) has negative consequences and rapidly deteriorates the household incomes and their assets, creating in many situations the social problems in families, such as a breakdown.

INDIGENOUS KNOWLEDGE FOR RESILIENCE AND ADAPTATION

INDIGENOUS KNOWLEDGE OF RESILIENCE

Resilience in the new paradigm of disaster risk reduction is defined as the capacity of a community, society or system to resist potentially to hazards in order to pursue the existing functioning or to maintain an acceptable level of new functioning and structure [21]. However, according to the group discussion, the resilience-locally refers to *adkeysii* opposite of vulnerability *nugul* – for the pastoralist means the ability to resist and to recover from hazards and risks occur in their locality. This resilience traditionally is classified into four main categories, the first resilience of human/herder, the second resilience of the pastoral community social network, third resilience of livestock, and the fourth resilience of ecosystem/habitat.

RESILIENCE OF PASTORALIST/HERDER

Broadly speaking, for the long time, the pastoralists were strong enough *Lihin* and capable to adapt to all tough conditions. Despite, the hunger and thirst, at the same time they are proud of their tedious and tiresome work under hard circumstance. They used to exercise their routine activities, such as caring animals, movement, watering livestock, cutting trees for making home equipment and accessories, meetings with elders for information sharing and exchange news on situation and other necessary activities. Another hand pastoralists /herders have high self-assurance and enjoy complete freedom and independence without any stress.

Regarding Table 1, the discussants have attributed to that the pastoralists at the previous time used to drink the fresh milk and eating animal meats. Also, in their habitat has a plenty of vegetation *dihin* suitable for eating with high ingredients of nutrient, fibre and many types of vitamins, which called loosely *Qadhabsi*. In addition to that they have fresh air and clean atmosphere. Result of these positive composition, pastoralist were more healthy, more strong, more resistant to the harsh environment and less strain from external difficulties.

However, nowadays unfortunately, fitness of the pastoralists for exercising their responsibility toward household and livestock is dramatically fading. There are determinant factors for deterioration of the condition to that level, such as recurrent droughts, prolonged shocks and risks and climate variability, the rangeland and forest areas is disappearing and vegetation is shrinking in vast areas of the region. All these combinations result the decreasing of livestock production and by-products, also. This in turn, the physical and mental power of pastoralists adversely has affected. Similarly, pastoralist/herder does not eat adequate food that contains sufficient nutrients. Other political, social and economic elements are associated with the abovementioned factors.

It is important to note here that there is a considerable number of pastoralists practicing some harmful habits which has a negative impact on their health and social interactions, notably the chewing of *Khat* and smoking.

Table 1. Resilience characteristics of pastoralist/herder. Sources: Focus Group Discussions and Key informant interviews.

Characteristic	Detail activities
Dynamism	They have ability to achieve in a day a number of activities in different areas without rest. The main activities they used to exercise such as caring animals, movement or travelling for purchasing stable food, watering livestock, cutting trees for making home equipment and accessories, meetings with elders for information sharing and exchange news on situation and other necessary activities.
Durability	They may walk tens or hundreds of km under harsh climate, rough and roadless, with little of drinking water and food, in order to accomplish a specific task, for instance, when a herder man travels long distances in search of grazing place or water or lost animals or for other reasons.
Desirability	They do their responsible independently with high eagerness, with less control and pressure from outside. Additional to their daily routine, they like to be in frontline voluntarily to participate in all social support activities, for example, in a meeting for sensitive issues, solving of conflicts, collecting of supports for needy people and so on.
Knowledgeable	Pastoralists/herders have knowledge and skills through practical experiences in their environment. They know name of vegetation, terrain, landscape and habitat, type of soil, type of salt, livestock species and diversity, seasonal calendar, weather predicating, traditional healing both human and livestock and so on.

RESILIENCE OF SOCIAL STRUCTURE

Somali society is well-known for its strong social network and relationship. This system is rooted on Islamic principal teaching and old Somali traditional of social structure. The social network system functions in different ranges and has several pillars. Some of them are compulsory, others are socially mandated, and some are individual voluntary-based. The social network considerably contributes building of social capacity, minimizing of vulnerability, sustaining of recovery as well maintaining of social existence. However, the main aim behind this social mechanism support is to promote social relationship, social protection, reduce poverty and vulnerability and to increase social equality. As a group discussants revealed, the main pillars of social structure of Somali pastoral community one can categorize in three sections, as described further in this text.

Section one: Compulsory

Zakat is a form of Islamic social financing system through which required from all better off to provide a certain amount of their wealth or assets (money or livestock or seed crop) to the people in need based on Sharia requirements. This both rural and urban is required equally. This form of social support performs a great in terms of supporting destitute people and gives them a mechanism to govern and recover newly on their livelihood after hazards or shocks.

Section two: Socially mandated

This section of social support network mostly practices in rural communities. The system is based on social or society obligation between community parts in a certain area. This can be a clan based form, or locality based form or other forms of agreement *xeer* which agreed by a specific community. Mainly, this system is not a long time social support system rather than a one-off disposal support, in order to reduce vulnerability and increase of resilience of the needy households. The most acknowledged types of this system are as follows.

Qaadhaan (risk pooling) this system of social network, is used when membership of community commits an action like killing to someone whether it is deliberately (*ula-kac*) or not deliberately (*kama*). In this case, the community automatically paying the *dia* which is a certain amount or livestock (mostly camels) according to Somali customary law (*xeer*) as a compensation of the action. Traditionally, 100 camels must be paid if the victim is male and 50 camels if the victim is female. The terms of the payment type and time and how to collect depend on relationship ties between the paying clan or group.

Xoolo-geyn (unconditioned free gift) is a type of social support network based on free gift. Whenever a member of community experiences sudden shock or loss of livestock or asset, the elders or leaders collect livestock from community and provide with it the destitute *cayd* who lost all animals or assets.

Dhowrto (surplus milk stored): This type of social support is more pro-active and preparedness. The system aims to collect and store the surplus milk in the better time in order to distribute the pro-poor families with no milking animals in the dry season.

Section three: individual voluntary based

Broadly, this section of social support network is based on personal willingness without any pressure from social authority. This type is merely more clan kinship and relative connection basis.

Maalsin or *irmansi* (temporary loan). This is to provide a member of your kinship to lactating animals (cattle or goats) in a loan basis for a period of time. Usually the agreement

is between two individuals. The animals will return when the condition of borrower changes to better or livestock gives birth. *Sadaqah* (almsgiving) is given to all people in need, kinship or not. This can be a form of money, livestock, kind or whatever has a value to the needy person. Obviously, this type of alms giving is unlimited in terms of quantity and the timeframe.

Qowsaar or Raci (livestock care). Poor households arrange their younger or children men during hardship time to look for or herd the better off households to their livestock in order to get food and other benefits as a payment. Based on focus group discussion and key informants, all these religious donations and cultural network supports are common and still practices in the Sheygosh *woreda* particularly in the pastoral community. Unfortunately, with recurrent droughts, calamities, shocks and other associated factors those triggered vulnerability of the pastoral community, the social reciprocal system is increasingly declining and less unfeasible specifically social and individual based, as certain groups may become more disadvantaged than others.

Resilience of livestock. Livestock is the mainstay of pastoralists' livelihood dating back to thousands of years. Based on that, livestock has given highly consideration and priority, in terms of caring, searching for apt grazing, watering, salting, inspecting from diseases by providing drugs, looking for apt grazing and rangeland and so on. Therefore, livestock resilience to diseases, heat, walking to a long distance, interval period for watering and more others were extremely amazing.

The mechanisms and strategies for increasing livestock resilience practice by the pastoral community in Sheygosh specifically and the Somali pastoralists in general are more than to summarize in these pages. However, the pastoral indigenous knowledge in resilience and adaptation (environment, biodiversity, rangeland and vegetation) is priceless knowledge needed to collect and document.

Resilience of vegetation/habitat. The range land is part of pastoral livestock livelihood as pastoralists believe. There is a darling relationship between pastoralists, livestock and their environment due to their proximity. The land is their key asset, makes it possible to use its natural resource. However, as interviewed groups, in previous era the pastoral ecosystem was rich and full of vegetation, has all types of plants, flora, and minerals which suitable for both human being and animals life.

For the last couple of decade, rangelands, forests and all types of vegetation gradually change from fertile lands into a desert land, due to recurrent hazards, climate variability, and other calamities, notably, gully erosion, soil degradation, intensive clearing and cutting of trees. As a consequence, palatable grass species and shrubs in the grazing area disappear, and this in turn, gradual invasions of unusual plants and vegetation drive away edible grazing species which livestock unable to digest or in cases cause unknown diseases or kill livestock. Also, insects, biting flies and infestation increase.

According to Figure 4, the pastoralists resilience capacity over the past decades shown that their anticipative and absorptive capacity to minimize the shocks through planning and preparedness and also their adaptive capacity to respond to situations were effective and strongly reduced their vulnerability and support to their withstand to future events. However, transformative capacity through well-functioning system of disaster risk management is vital and important currently. This transformation for changing and improving of the critical situation faces pastoralists in the region amidst climate change and recurrent hazards required a comprehensive strategy applicable to the pastoral community nature. Though a number of strategies have been put in place, many of these policies were more agricultural-oriented and lack a profound understanding of pastoral community context, and thus eventually the expected results and outcomes completely did not achieve its targets.

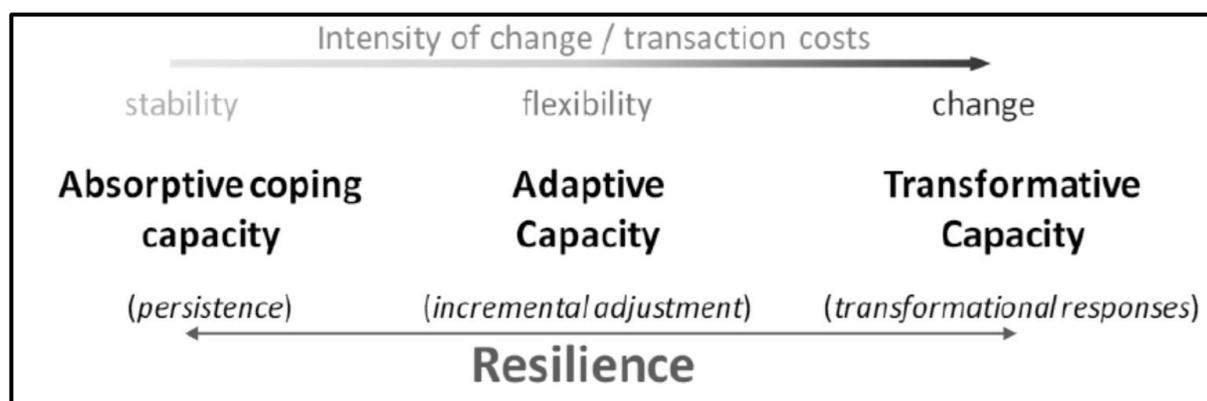


Figure 4. The relationship between three types of capacities for strengthening resilience [22].

Broadly speaking, the resilience situation of the pastoral community in Sheygosh *woreda* is in a brink, in all aspects, socially, environmental, economical. Therefore, unless pertinent mechanisms put in place to address the underlying causes of existing vulnerability, the resilience capacity of pastoralist communities in Ethiopia will not persist and become more collective [23].

INDIGENOUS KNOWLEDGE ADAPTED BY PASTORALISTS IN SHEYGOSH

Pastoral livelihood production in Somali community is subject to hazards and unpredictable shocks. At the same time this community inhabited arid and semi-arid climatic zone which is categorized one of highly susceptible to environment hazard. These adverse climatic conditions have led to be vulnerable and insecure pastoral livelihoods. Therefore, as group discussants discussed, the pastoral community has adapted different strategies and mechanisms in order to withstand in harsh ecology and ecosystem.

According to Sheygosh community, the pastoral community has a long history of resilience and adaptation that practices over years. These strategies rely on mobility and movement, keep herds mixed types, informal social support network system, traditional institutions structure and knowledge reduce consumption of food, diversity of consumption, reducing non-essential spending and local migration and household member splitting and sending to towns and so on. However, these survival strategies are gradually adapted based on priority and importance. For instance, strategies which are most damaging to livelihood of community status or social structures are adapted last such as selling assets, farmlands and other prestige properties [19]. Pastoralists in semi and arid semi environment have the most strong and successful adaptable system among rural population systems [24].

Adaptation strategies practiced by the pastoral community in Sheygosh *woreda* as discussion groups revealed are more. But the common and the most useable in pastoralists to reduce the vulnerability results often from unpredictable and weather variability patterns.

INDIGENOUS KNOWLEDGE FOR WEATHER FORECASTING

Somali pastoralists in the study area have developed their own early warning system based on long-term observation and experience which is highly perceived as a source of anticipating and a tool for decision making. Therefore, in order to understand these weather forecasting traditional indicators, the outcomes of the discussions are grouped in the following sections. The pastoralists have been used various indicators as shown in Table 2.

Table 2. Major indicators use the pastoralists for forecasting. Sources: Focus Group Discussions and Key informant interviews. Key is rank ranging from low (1) to high (5).

S/n	Indicators of weather prediction	Rank by priority based on community discussion outcomes
1	Astral bodies indicators (stars, moon, sun)	5
2	Seasonal calendar	4
3	Fauna (behaviours of livestock, animals, birds)	2
4	Atmospheric indicators (clouds, winds, lighting)	3
5	Flora (behaviours of plants and vegetation)	2
6	Human practices, norm and cultures	1

TRADITIONAL COPING AND ADAPTATION STRATEGIES

Sahan (scouts). *Sahan* (scout) is a major source of information about the weather and climate change, since they are periodically on move in search of better pasture and water for their animals. *Sahan* system also plays a pivotal role on decision making processes on migration patterns. Normally, the assessment include, distance and condition of pasture and water, estimation on how long the fodder and water sustain a given number of livestock, type of fodder and others.

Mobility/Migration (*Hayan* or *keynaan*). Mobility is the key strategic of coping with, adapting to and withstand in the pastoral community to reduce stresses. Mobility is an old existing dynamic system for pastoralists for move in and move out strategy. The mobility of pastoralists with their herds is well pre-planned and enough consultation with the elders in that locality. Before movement start, a few respected and knowledgeable men sent to survey areas which are expected to have better forage, free from insects and biting flies and suitable for residing. If a survey team finds a better place, *Sahan* marks the area and immediately informs the elders to move in the direction of the new location.

According to the group discussion results, the pastoral community practices mobility over decades as a risk minimize and adapting mechanism strategy to hazards.

Splitting of Herds and Families. During dry period when the access and availability of pasture and water deplete, pastoralists split their herds and families into different locations. Splitting of herds and families is one of the coping and adaptation strategies in order to reduce adverse impacts of hazards. The splitting of herds and families depends on the types and condition of animals and labour availability and requirement for those particular animals in particular location.

The splitting of herds and families are risk reduction mechanisms that have been practiced for long by pastoralists. Animals may be kept in several different areas which reduce the effects of localized droughts, and disease outbreak.

Eating wild trees (*Qadhaabsi*). During severe droughts people used to consume wild trees those have fruits or seeds as an alternative of stable food because of food deficiency. The common tree is *Garas* (tree species *Dobera Glabra*). This tree has seeds similar to beans seed and is evergreen tree. Before eating they dry under sun then kept/stored for household consumption throughout drought time.

Land closure. Although closure or preserving land for grazing purpose was not commonly known in the study area, but for the last couple decade people were seen practiced in this type of coping particularly agro-pastoralists communities. The intention behind is to create a fodder bank for the use in drought time to mitigate the adverse impact of the drought on animals. This kind of land closure pastoralist termed on *Jarmi*.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The objective of the study was to explore the existing indigenous knowledge in pastoral livelihood system for resilience and adaptation used by communities in Sheygosh *woreda* as coping mechanisms to response hazards threat to their livelihood and environment. The Study found that pastoral production system is still the dominant livelihood in Sheygosh *woreda* for about 75 % of population. Nevertheless, the new move to agro-pastoralists is an alternative livelihood for nearly 15-20 % of population.

According to the perception of Sheygosh *woreda*, over the last couple decades severe and frequent climate variability is observed notably, drought which is a recurrent phenomenon in their locality and has adverse impacts on people livelihood, ecosystem of rangeland, natural resources and social aspects as well livestock production. As a result, the traditional pastoral production system has faced a number of challenges that affecting the practicing of pastoral production system. The main attribute underlying reasons are recurring drought, generating of new alternative livelihoods, education role, restriction of movement and mobility, migration from rural to urban area, low basic service delivery and social protection, moderation and mindsets towards rural livelihood.

The study shown that the pastoral community in the study location has numerous of effective traditional knowledge for resilience and adaptation strategies in the past, used to increase the livestock productivity and to minimize vulnerability. These strategies rely more or less on mobility and movement, diversity of livestock, social support network system (Zakat, *xool-goyn* – unconditioned free gift, *dhowrto* – surplus milk stored, *sadaqah* – almsgiving, *qaadhaan* – risk pooling, *maalsin or irmansi* – temporary loan), customary institution structure and traditional knowledge, reduce consumption of food, diversity of consumption, reducing non-essential spending and local migration.

Broadly speaking, despite the effectiveness of indigenous knowledge strategies, the pastoral traditional risk management and coping strategies have increasingly become ineffective and will not be viable and sustainable in the coming years, due several underlying causes, including climate variability and prolonged hazards, lack of pro-poor livestock policies, absence of effective investment and intervention address social chronic problems, natural and environment problems and similarly economic and investment dimension of pastoral production.

RECOMMENDATIONS

Based on findings, this research proposes the following recommendations in order to build upon and promote pastoral indigenous knowledge in order to sustain the pastoral production system in the face of climate variability and prolonged calamities:

- strengthening and restructuring of social protection intervention projects, includes expand microfinance systems, including pastoral and agro-pastoralist as a safeguard mechanisms,
- multi-sectoral direct addressing to the underlying causes of low productivity and production of livestock, land degradation and rangeland habitats.
- despite the pastoralists have traditional strategies for adapting to and withstand to climate variability very well, there is in dire need to build and support their mechanisms technical knowledge, in order to incorporate indigenous knowledge into national policy of disaster risk reduction,
- documenting and identifying all pastoral resilience and adaptation strategies, such as environment, grazing land, livestock, social and also their knowledge for forecasting and indicators such as the trees, plants and birds which have traditional knowledge and value as climate indicators, declare them as protected species,

- although such strategies relevant to grazing system initiated several times, but still there is urgent need to put in place appropriate grassland management system, which contribute to increase resilience and adaptation and mitigation, as well as increasing pastoral production and food security minimize and reducing vulnerably,
- recurrent shocks, risks and hazards have increasingly dictated to initiate proper risk management mechanisms or to reinforce already existing mechanisms to cope with the impacts of extreme climatic events, notably early warning systems, and risks and vulnerability mitigation activities.

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THE SOCIAL CONSEQUENCES OF PASTORALIST SEDENTERISATION SCHEMES IN SOMALI REGIONAL STATE, ETHIOPIA

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ABSTRACT

Background: This study was carried out with the objective of assessing the social consequences of pastoralist sedenterisation schemes in Beer Caano district Shabelle Zone of Ethiopian Somali Regional State. Household data were collected from 154 households drawn randomly from three kebeles. In light of this, both primary and secondary data were used. The main tool of data analysis for this study was descriptive statistical and thematic analysis.

Results: Descriptive statistics results indicate that there was a significant mean difference at different levels of significance between before and after sedentarization of pastoral households in terms of household size, farmland size (in hectare), TLU holding and annual income. With regard to access to social and institutional services, after sedentarization schemes in the study area, there are improvements of social and institutional services in terms of education, health, water and sanitation, communication, irrigation usage, use of improved agricultural inputs, extension service, credit and market services. The sedenterization scheme has slight effects on the traditional and social aspects of resettled households that contributed social consequences in the study area.

Conclusive remark: Improving the production, productivity and marketing conditions of crop and livestock, and provision of basic social services would improve the livelihoods of pastoral household in the study area.

KEY WORDS

Beer Caano district, pastoral households, sedentarization

CLASSIFICATION

JEL: Q15, Q56, R14

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BACKGROUND AND JUSTIFICATION OF THE STUDY

Sedentarization have costs and opportunities for settled pastoralists, particularly on the health and well-being of community (especially women and children), those most at risk of morbidity and mortality [1-3]. Several studies, however, report negative social and health consequences of pastoral sedentarization including poorer nutrition, inadequate housing, lack of clean drinking water, and higher rates of certain infectious diseases despite better access of settled populations to formal education and health care [4-8].

Sedentarization is an increasing phenomenon affecting all sectors of pastoral society. It negatively impacts on women and girls including increased domestic and income generating burdens, especially when men need to stay away from the household to graze livestock at distant communal sites or to seek alternative employment because of government policies restricting land access, environmental degradation or conflict [4]. Settled pastoralists are often unable to keep their livestock close by and sometimes lose their animals completely. For women, this translates into the need to find alternative cash incomes for their livelihoods (which in a portion includes prostitution).

The sedentarization process has positive and negative influence on the pastoral livelihoods. In terms of health, the sedentary life has enabled pastoralists to access health services, water and sanitation facilities but it has also increased the risks of disease transmission and poorer nutrition. When sanitation facilities, health services and safe water quality lack in settled communities the consequences can be fatal. In terms of ecology, the sedentarization process naturally leads to higher density of humans and animals, and thus often higher pressure on pastures in the same area. Sedentarization had also enabled the pastoralists to engage more in agriculture at the same time as this indicated a shift from a livestock-based economy with primarily home consumption to a more market-oriented economy. In terms of Society, the sedentarization process did not seem to impact the rates of conflicts in the visited area. However examples from similar processes exemplify the importance of awareness and carefulness when such processes are encouraged.

In general, there is a long history of attempting to sedenterization of pastoralists but these processes often have limited success. In the horn of Africa, there have been different attempts to settle pastoralists, but they have largely failed [9]. In Somalia the government engaged in large-scale settlement schemes for displaced nomads because of the persistence of droughts and wars [10]. Policy-makers argue that it is difficult to provide services to nomadic pastoralists, and they cannot be easily contacted unless settled.

Different researchers' have conducted study on resettlement such as Kassa [11] conducted a study on resettlement and sustainable livelihoods in Ethiopia *A comparative analysis of Amhara and Southern regions*. This study focused on analyzing the effects of planned government intra-regional resettlement program on the sustainable livelihoods of settler households in Amhara and Southern regions, mainly targeting comparative analysis of regions. Bisrat [12] conducted study on impact of resettlement on the livelihood of settler population in Abobo *Woreda*, Gambella People's Regional State. This study focused on assessing the impact of resettlement on the living condition of the settler population in Abobo *Woreda* by Targeting livelihood outcomes in the study area. Dessalegn [13] analysed challenges and prospects of the post 1991 resettlement program in the quest for food security: the case of Kenaf Site, Western Oromia Region, Focused on mainly food security status of the resettlers. Kari [14] conducted a study on the health and ecological impacts of sedenterazation in Ethiopian Somali Regional State, Filtu *Woreda* of Liban Zone. Yet, that study focuses on the health and ecological impacts of sedenterization program on the pastoral

community. Ali [15] conducted study on post-resettlement status of soil degradation and land management practices at Gubalafto *Woreda*, North Wollo, and Ethiopia: the case of three selected *Kebeles*. That study focused on examining the overall contribution of the 1984's resettlement program in alleviating soil degradation and the change in land management practices in the areas of origin of resettlers by assessing rate of soil erosion, the current status of soil quality as well as the changes in land management practices and farmers' perception after the resettlement, Mainly targeting the soil quality of study area. Asfaw [16] conducted a study on West Wellega Zone, Oromia Region, on the resettlement program with the time frame of 2003-2004. This study focuses on the processes of resettlement in general on the settled people of the West Wellega Zone, mainly targeting the agrarian actors. Mengistu [17] conducted study on the effects of resettlement schemes on the biophysical and human environments: the case of Gambela Region, Ethiopia. Asrat [18] conducted study on the dynamics of resettlement with reference to Ethiopian experience. Focused on understand how the resettlers were adapting to their new situation (where they adapting positively or negatively and what new institutional arrangements had been put in place). Gebre [19] conducted a study entitled: differential reestablishment of voluntary and involuntary migrants: the case of Metekel settlers in Ethiopia.

Taking into account the above researches and arguments one can see that there is a gap both in the area and aspects of sedenterzation program covered. Therefore, this study assessed the social consequences, both the positive and the drawbacks, of Sedentarization schemes of Ethiopian Somali Regional State.

Therefore, this study tries to fill this research gap and aims to build a better understanding of pastoral sedenterization process social consequences in the study area and narrow the existing information gap on sedenterization constraints, problems and future prospects. The study also tries to enlighten the concerned government institutions as well as policy makers for a better and thoughtful decision for improving the pastoral sedenterization process in the study area. This study focuses on the Social Consequences of Pastoralist Sedenterisation Schemes, the Case of Beer Caano district Shabelle Zone of Ethiopian Somali Regional State.

CONCEPTUAL FRAMEWORK OF PASTORAL SEDENTARIZATION SCHEMES

The supporters of the resettlement policy focus on the livelihood diversification aspects which received limited policy attention in the past. Since the PASDEP and consequent emphasis on livelihood diversification within the agriculture sector and it is one of its challenges towards pastoral development strategies. Still, the new pastoral development policy declared recently focuses on the resettlement of the pastoralists around rivers and water potential areas and gives poor consideration in targeting the nomadic pastoralists in the arid parts of the region where access to water is the main challenge.

Figure 1 describes the conceptual framework for the sedenterization process taking in Ethiopian Somali regional in riverine areas around main river banks. The people in this region grow limited type of crops like sorghum and maize but only in the rainy season. During the droughts, the pastoralists face serious asset depletion. A high scale irrigation system could be developed in riverine areas of the region to reverse drought induced problems. Thus, the people in region and its districts can be resettled to benefit from these ample resources. The Somali region basin development plan passes through three stages: from resettlement to full transformation. The implementation of stage one and stage two leads to full settlement of pastoralists while in stage three full transformation will occur. Likewise, stage one and stage two are also short and medium term strategies respectively whereas stage three is a long term strategy of the region.

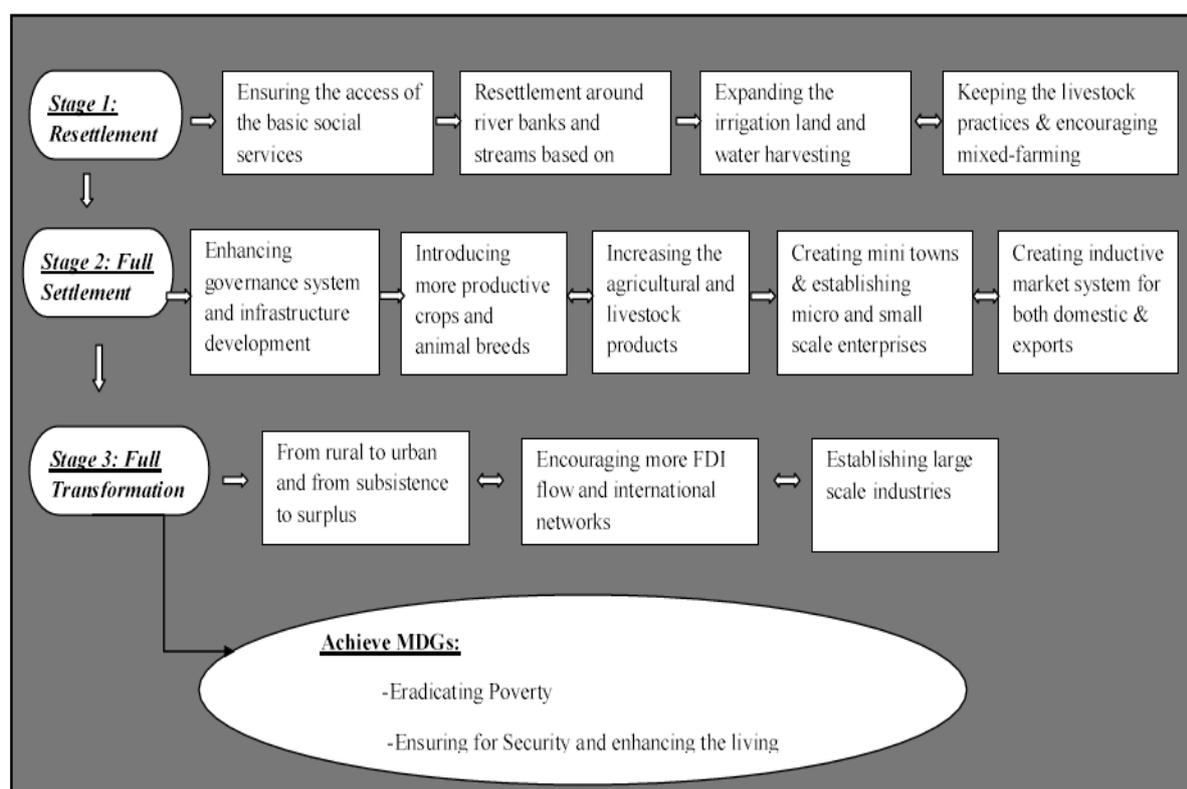


Figure 1. Conceptual framework of pastoralist sedenterization process.

Thus, sustainable development and poverty reduction could be realized in the arid pastoral areas if the diversification issue moves beyond farming and promotes livestock and livestock product based trade of milk, hides and skins, and animals. Yet, the current resettlement program has challenges which hindered the expected production capacity. Some of the main challenges include:

- a lack of community awareness on the advantages of resettlement program,
- land ownership claims by the clans settled there,
- extensive drought and dryness of the rivers,
- shortage of the skilled manpower and the agricultural materials,
- inadequate basic social facilities, and
- flooding of the rivers after rains started.

The implementation of the resettlement policy creates strategic challenges. The availability of water in most parts of the corridors has been a bottlenecked for the foreseeable future. Water development for irrigation, whether for channeling groundwater flows, river diversion or runoff catchments are all require investments in infrastructure and management capacity. Effective sustainable land use management combined with transport, communication and market infrastructural development are also required. A crucial challenge is the parallel to improve the productivity of livestock and develop special intervention programs in the arid pastoral areas to transform into settled livelihood and improve their standard of living. On the other hand, the diversification or the mixed farming system is not new to the region however only recently have these areas been used for resettlement on such a large scale.

RESEARCH METHODOLOGY

This section briefly describes the study area and describes methodology of the research including sampling technique and sample size, types, sources and methods of data collection and analysis.

RESEARCH AREA

Somali regional state is second largest regional states found in Ethiopia. It is organized into 11 zones and 93 districts. Shebele zone is one of the 11 zones of Ethiopian Somali regional state and located 1219 km away from the region main city Addis Ababa and 591 km to the region main city Jigjiga. The district is locate within latitudes and longitudes of 5°57' N 43°27' E and 5,95° N 43,45° E. The district is found in Shabelle Zone in eastern Ethiopia, and, 44 km south of the capital of the zone Gode. The district has a total of 13 Kebeles, total population of 61 970 and 10 328 households [20]. Among the 13 Kebeles, sedenterisation has been taken in 12 Kebeles. The district has a total of 9 995 households in the 12 Kebeles [21].

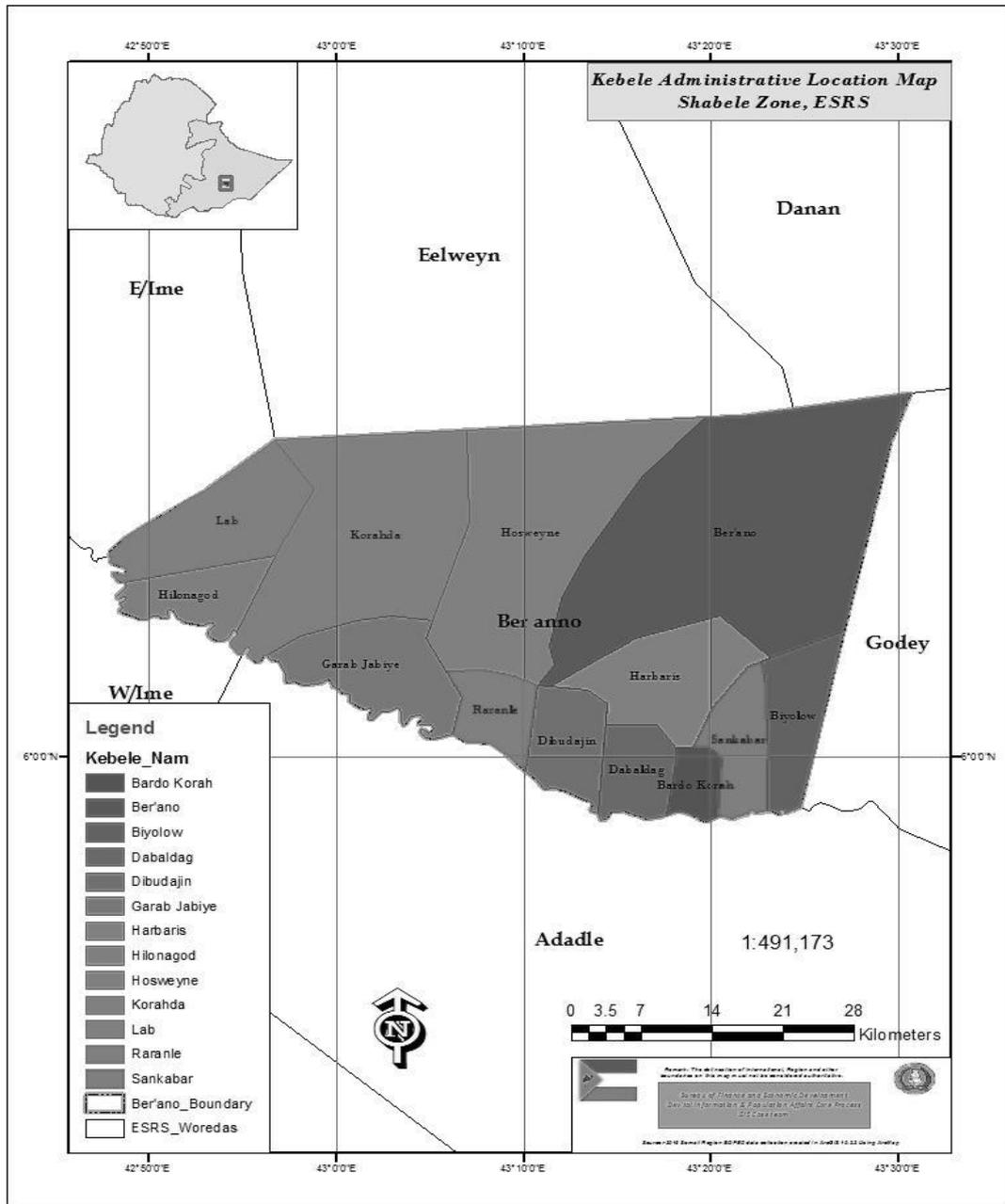


Figure 2. Map of the study area [20].

Shabelle Zone has the largest water/river source in comparison to other zones of the region. Beer Caano district was selected purposely for this study because the existence of large sedenterization sites in the Shabelle zone and region. Since the district is located along the

Wabishabele River, it has the largest resettlement sites as compared with other districts of the zone and there are mass sedenterization intervention program in the district. In the process of selecting the sample, a multi-stage random sampling procedure was used. In the first stage, three sedenterized Kebeles were randomly selected from the total twelve sedenterized Kebeles that exist in the district. The determination of the surveying sedentarized households were made by using simple random sampling. The sedentarized households in the three Kebeles of Beer Caano district were recorded and among the list of these three sedentarized household Kebeles a representative sample size was drawn based on Yamane's formula. Following the identification of the sample size, informal survey and pre-survey visit was conducted in the sample areas. This made possible collecting the wide range of information by visiting the areas, making dialogue with key informants, focus groups and participating in the community discussions. Based on the information obtained and learnt experience from the informal survey, questionnaire that was used latter in the formal survey was drafted and structured. Moreover, the questionnaire was pre-tested for its appropriateness and further improved before it was used.

SAMPLE SIZE DETERMINATION

The existing literature debates the issue of successful selection and meaningful sample-size. Determining sample size varies for various types of research designs and there are several approaches in practice. Sample size determination is an important element in any survey research, although it is a difficult one. A Simplified formula for Proportions was developed by Yamane has been used in this study. Accordingly, Yamane [22] provides a simplified formula to calculate sample sizes.

$$n = \frac{N}{1 + Ne^2}, \quad (1)$$

where n is the sample size, N is the population size, and e is the level of precision.

According to data [20] the total population of Beer Caano district is about 61 970 with average family size of 6 persons per household and 10 328 households. According to the Ethiopian Somali Regional state Irrigation and basin development coordination bureau [21], the total sedenterized households of the Beer Caano district was about 9 995 households. Values for 92 % confidence level and $e = 0,08$ are inserted into (1) to obtain:

$$n = \frac{9995}{1 + 9995 \cdot 0,08^2} = 154. \quad (2)$$

Following Yamane formula [22], the sample size of 154 sedentarized households were selected randomly from pre-selected three sedentarized Kebeles. This sample size was assumed to enable us to gather richer data with regard to demographic, socio-economic behaviours, livelihood styles, environmental factors, traditional institutional setup and others. After having the total number of households in each of the three sedentarized Kebele households' probability proportional to size will be employed to select the sample households from the three sedentarized Kebeles. Accordingly, the selected 154 sample households will be interviewed by using semi-structured survey questionnaire.

Table 1. Sample frame and distribution in the study area.

District name	Kebele name	Target population households	Sampled households
Beer Caano	Dib u dajin	700	42
	Har baris	750	45
	Sanka Bar	828	57
Total		2278	154

This study was mainly depending on qualitative and quantitative primary data which was collected by using structured questionnaire. Data was gathered from household level survey of 154 sample households using structured questionnaire. The study was also supplemented by qualitative data generated through focus group discussion, key informant interviews and the researcher's field observation. For the data collection, five college or high school graduate enumerators who speak the local language fluently were recruited from the study area and they were trained. During the data collection phase the researchers were supervised by the enumerators. The filled questionnaires were thoroughly checked on the daily basis for the completeness and for possible re-interview if deemed necessary.

In addition to primary data, relevant secondary data was collected from Beer Caano district irrigation and basin coordination office, administration, health office, water office, zonal offices, Ethiopian Somali Regional State line bureaus, NGOs and organizations operating in the district. Both published and unpublished documents were extensively reviewed to secure pertinent secondary information.

METHODS OF DATA ANALYSIS

Descriptive statistical analysis like percentages, ratios, mean, frequencies and others were used to assess the sedenterized pastoral households in the study area based on the social consequences, demographic, socio-economic situations of the sampled households. The data from survey questionnaire, key informants interviews, focus group discussions and observation were analyzed and described through statistical analysis after collecting, sorting out, grouping and organizing of the data by using statistical STATA version 11 software tools. In addition, inferential statistical test of paired t-test was employed.

RESULTS AND DISCUSSION

LIVELIHOOD CHARACTERISTICS OF SAMPLED HOUSEHOLDS

Survey results show that the sample resettled pastoral households were pushed out from their original places due to drought, rangeland degradation and shortage of water problems respectively as the main causes to sedentarize the pastoralists, Table 2. In addition, government through its development interventions and policy for provision of basic social services to pastoral community designed and implemented mass sedenterization schemes.

Table 2. Causes of pastoral sedenterization in study area.

Cause	Frequency	Percentage
Drought	97	63
Range land degradation	20	13
Shortage of water	37	24
Total	154	100

LIVESTOCK HOLDING

According to focus group discussion and key informants', settlers were rear different types of livestock such as; goats, camel, sheep, cattle and donkey before and after sedentarized. Livestock contributes to households' livelihood in different ways, that is, as a source of draught power, source of cash income, source of nutrition and means of transport. Besides, livestock are considered as a means of saving and means of coping mechanism during crop failure and other calamities in the study area. According to survey data, the mean livestock holding (TLU) of the sampled households before sedentarization were 14,84 with standard deviation of 9,16. The maximum and minimum livestock holding of the sampled households

before sedenterization were 45,77 and 0, respectively. However, the mean livestock holding of the sampled households after sedenterization was 17,15 with standard deviation of 11,07. The maximum and minimum livestock holding of the sampled households after sedenterization were 60,07 and 0, respectively. The Paired sample t-test shows statistically significant difference in the mean TLU that households own before and after sedenterization at the 1 % level of significance.

As indicated in Table 3, after sedenterization households have more livestock holding compared to the situation before sedenterization in study area. The reasons may include that after sedenterization the livestock got better feeds, handling and management because before sedenterization livestock was feed through open grazing land with communal rangeland degradation. Generally, there were increments of livestock and livestock production after sedenterization as compared to before sedenterization. In addition, due to low prevalence of animal disease and accessibility of veterinary services in the study area that may increase the number of livestock.

Table 3. Livestock holding of the sampled households.

Variable	Mean	Standard deviation	Maximum	Minimum	t-value
TLU before sedentarization	14,84	9,16	45,77	0	-5,34***
TLU after sedenterization	17,15	11,07	60,07	0	
Annual income before sedenterization	12 264,29	6 322,52	36 000	2 100	-11,65***
Annual income after sedenterization	16 127,27	6 475,78	39 500	5 000	
Land holding before sedenterization in hectare	0,00	0,00	0	0	-35,38***
Land holding after sedenterization in hectare	1,40	0,040	2	1	

***significant at 1 % probability level

ANNUAL INCOME OF THE HOUSEHOLDS

According to focus group discussion and key informants, settlers' main income source is agriculture that composed of livestock and crop production while before sedenterization main source of income was only livestock production. These contributed to households' livelihood diversification. The study area has a potential to produce high value crops like sesame, haricot bean, soybean and fruit plants (mango and banana). So, it is economically feasible to specialize on these crops beside the food crops growing in the locality like maize and sorghum. According to survey data, the mean annual income of the sampled households before sedenterization was Birr 12 264,29 with standard deviation of Birr 6 322,52. The maximum and minimum annual income of the sampled households before sedenterization was Birr 36 000 and Birr 2 100, respectively. However, the mean annual income of the sampled households after sedenterization was Birr 16 127,27 with standard deviation of Birr 6 475,78. The maximum and minimum annual income of the sampled households after sedenterization was Birr 39 500 and Birr 5 000, respectively. The Paired sample t-test shows statistically significant difference in the mean of annual income that households own after sedenterization at the 1 % level of significance.

LAND HOLDING

Land size is considered as a critical production factor that determines the type of crops grown and the amount of crops harvested per season/year. Moreover, the availability of grazing land

is an important factor for livestock rearing. Therefore, under subsistence agriculture, land holding size is expected to play a significant role in influencing sedentarized households' living standard. Accordingly, the land holding of the sampled households after sedenterization ranged from 1 ha to 2 ha with an average of 1,40 ha with standard deviations of 0,40 ha. The average farm size before sedenterization was almost zero because the land was commonly owned with open grazing and rare land cultivation utilization.

In relation to this, farm size and overall production perspectives, there was also a group discussion on sufficiency of own crop production as well as wealth ranking conditions with key informants and sampled households. Out of the total sampled households about 80 % indicated that their current year crop production could feed the households all the year round because water is available all time with irrigation schemes but there is increasing irrigation cost of production. On the other hand, almost 20 % have reported that their current year crop production lasts up to five to eight months. In addition, about 10 % of the sampled households reported that their living standard turned for the worse, 70 % experienced better and improving living conditions and about 20 % had not come across any change (constant) in their living conditions over the surveyed period.

SOCIAL AND INSTITUTIONAL DELIVERY SERVICES

The main functions of social and economic institutions are to provide signals that will guide self-interested economic agents/entities to act in the interest of the larger community [23]. The main task of any nation-state is to create social and institutional arrangements that provide the needed signals to individual economic entities. In general, institutions and organizations are important aids to development. They may affect agricultural and rural development in many different ways, including provision of production inputs and services, reduction of transaction costs, enhancement of bargaining power of sedentarized pastoralists *vis à vis* those to whom they sell their produce and from whom they buy production inputs and services, influencing investments and savings that expected to enhance positive social consequences level in the society.

ACCESS TO EDUCATION SERVICES

It is a basic social service where by human capital could be developed, which is a necessary resource for livelihood improvement and positive social consequences. The all sedentarized *Kebeles* have school services which range from ABE to primary schools. The access to these services was measured against proximity and utilization. The findings indicate that 65,5 % of the sampled households have sent their school age children to schools while 34,5 % did not for various socio-economic problems of their own. This indicates that slight majority of school age children are at school which in the long-run could contribute to poverty reduction and positive social consequences.

The access to school services between before and after sedenterization was seen in terms of the average distance travelled to the nearest school .Proximity to school within the standard of ministry of education was considered as a measurement to access. Accordingly, it was found out that after sedenterrization the mean distance travelled to the nearest school was 5,75 km. but before sedenterization, there were no access to school services due to the mobility pattern of the pastoralists. The maximum distance travelled is 6 km which can be seen accessible by national standards. Moreover, the group discussants and key informants participants also have agreed that they have free access of primary education services to their families and the provision have shown an improvement after sedentarization. However, as mentioned above, access to primary school is available in all sentarized *Kebeles*but there is no secondary school in most of sedentarized *Kebeles* that caused large school drop out after completion primary

schools. Because sending students into *Beer Caano* district secondary school after completion primary school required additional costs which households cannot afford.

ACCESS TO HEALTH SERVICES

The all sedentarized *Kebeles* have access health services that range from health post to health center services levels. The majority of these services in the study area are provided through these facilities. To analyze the contribution of health services towards positive social consequences they are seen from accessibility to the health facilities and mortality cases faced by households. Access to health services in the study area after sedenterization, which is seen from distance traveled to the nearest health facility indicates that the meandistance traveled is 1,25 km.

The longest distance traveled is 2,5 km. But before sedenterization, there were no such health services due to long distance and the mobility nature of the pastoralists. In all sampled sedentarized *Kebeles* of the district there were no hospitals which can give better health services.

The occurrence of disease incidence indicates that the incidence of sick person was 45,9 % before and 35,33 % after sedenterization. The mean person per household who were sick in the study area is also found higher before sedenterization. Mortality cases among the sedenterization indicate that before sedenterization they have lost higher number of family members than the after sedenterization, the mean being 0,20 and 0,11, respectively which is a statistically significant result at less than 5 % probability level.

In addition to this, the group participants conformed that the health service (health post) is not operational for different reasons including lack of health professional, lack of medical supply and equipment and in some case lack of repair and maintenance of the facility. Therefore, according to them, they are obliged to travel to Gode town and spend extra money for transportation and health facility.

ACCESS TO WATER AND SANITATION SERVICES

Potable pure water coverage of the sedenterized *Kebeles* are so low that the access to it is determined by coverage. Quantity of water fetched and proximity to these services was analyzed. The average water usage by the households before and after sedenterization was 20,08 l and 90,89 l per day, respectively. Moreover, the mean distance traveled to water sources after sedenterization was 500 m. But before sedenterization they used to travel about 100 km in search of water with the aid of camels and pack animals. It took two days for round trip to get water, excluding queuing time which may require one extra day since the sources of water are traditional well, reservoirs (*birka*), *haffirs dams*, hand dug wells, ponds and rivers.

The access to clean water and the average daily consumption is also crucial for health, sanitation, productivity and hence run out of poverty. Both before and after sedenterization households do not have access to water sources at national standard. However, the daily average water consumption per household is higher after sedenterization. The mean difference which is statistically significant at 1 % indicates before sedenterization household consume less which is almost 0 l/day while it is 14,15 l after sedenterization. Before sedenterization households were found to consume below national standards which is 15 l per day and per adult equivalents.

In addition, according to focus group discussion and key informants, water affects the health of the people in the study area either by facilitating or impeding the transmission of communicable disease. Water born and water washed diseases are the most important health problems in the study area. These problems can be reduced and ultimately, be overcome by

using the shallow wells and covering the Birkas and the Haffirs. Before sedentization, in the dry season, most of the people were traveling long way under harsh weather conditions in search of water. Information available from focus group and key informants interview with community elders shows that they used to travel about 100 km in search of water with the aid of camels and pack animals, it took 2 days for round trip to get water, excluding queuing time which may require one extra day. Hence, most of the people who were living at far locations from the permanent water had the opportunity to save a time equivalent to 2-3 days. The other important benefit is energy saving. According to focus group discussion and key informants, the average proportion of the daily energy intake spent on water collection alone was estimated to in Birkas/Haffir dams are 27 % or more in dry areas. This indicates that more than 1/4 of the daily calories are on fetching water from distant places. Thus, the provision of water at closer distances saves much time which can be applied on other productive activities.

Children, to a certain limit, are relieved from the burden of fetching at least drinking water from distance places, but in the dry season, the burden of livestock watering still remains to be the responsibility of children. According to focus group discussion and key informants, women were also relieved from the burden of fetching water from distant places. In most of the villages before sedentization, women were obliged to breastfeed their babies only two times in the day-early in the morning and in the evening. But after sedentization water was made available in the community, women were able to breastfeed their babies as they wished.

ACCESS TO COMMUNICATION SERVICES

Almost all Sedentarized *Kebeles* have no a well-developed rural infrastructure that interlinks and connects different parts of the district or that creates communication access to the neighboring and adjoining zones/districts. One of the means of communication available in the sedentarized Kebeles is the gravel road that passes through the all sedentarized *Kebeles* from Gode to Beer Caano and East Imey. But this means of transport is inaccessible to most of the sedentarized communities for the reason that sedentarized households are residing at the remote areas far from districts, where there is farm and grazing land as well as water for their livestock. All weather roads coverage is as low as 20 km which goes from Gode to Beer Caano and east Imey through sedentarized *Kebeles*. These roads are serving as the routes to the main market outlets allowing trade agricultural and non-agricultural items for the Beer Caano at large and sedentarized *Kebeles* in particular, but not accessible for the majority of the sedentarized households. In addition, the Gode town has Ethiopian airline means of transportation, which is start from Addis to Dire Dawa, Jigjiga and Gode for five days per week, but this means of transportation is very expensive and has limited flights that hinder accessibility of services by sedentarized *Kebeles*. Except the above mentioned outlets there is no other means of transportation that permits movement and communication to facilitate market integration. As a result, people and animal trek long distances to reach social service centers and markets. In addition, the participants of group discussants at sedentarized areas as well agreed that transportation service is one of the most serious problems. Due to two problems first all-weather roads are limited and second the cost of transportation is very high.

Until recently, all sedentarized *Kebeles* have no telecommunication centers and telephone services. People have to travel up to 70 km on average in order to get telephone services. In the sedentarized community, the postal service is totally missing and absent in sedentarized community in the study area.

IRRIGATION USAGE OF THE HOUSEHOLDS

From the total sample households, 92 % use irrigation for crop production. Sedentarized households of *dib-udajinta* and *Haar-bariis Kebeles* get irrigation water from two modern

small scale irrigation dams, which were constructed by the government after the sedenterization program was implemented. Most of the households from *Sankabaar Kebele* use traditional irrigation schemes which were diverted by the beneficiary households. But before the sedenterization there were no even cultivation of land let alone irrigation usage. The survey result revealed that sedentarized households had more access to irrigation water with a statistically significant difference at 1 % probability level.

USE OF IMPROVED AGRICULTURAL INPUTS

To raise farm productivity per hectare and livestock head only 106 (68,83 %) sample households utilized different improved varieties and commercial fertilizers. The rest, 48 (31,17 %) did not utilize any improved agricultural inputs in the last cropping seasons. But before sedenterization, there were rare even cultivation of land, let alone improved agricultural inputs usage in the study area.

EXTENSION SERVICE PROVISION

Many of the sedentarized sample households have access to extension advice by three development agents assigned to each rural *Kebele* administration. Accordingly 84 % of sedentarized households have access to extension services. However, according to the planned extension service provision program practical training of farmers at farmers training center was not practically conducted at all the study *Kebeles*. The development agents provide only technical advices on farm which was not practically supported by demonstration as per the program schedule proposed by Bureau of basin development coordination and agriculture and natural resource development to ensure food security. But before sedenterization, there were no extension services at their origin of place because of way of life.

ACCESS TO CREDIT SERVICES

Credit institutions play a vital role in the livelihood of rural dwellers by providing loans so that poor households boost their economic performance. The available utilized sources of finance in the study area were friends or neighbors (34,69 %), relatives (50,38 %) and merchants (14,93 %). The credit service is rendered both in cash and kind (agricultural inputs). Credit is important to resource-poor sedentarized households who cannot finance agricultural inputs to purchase at early stages of technology adoption. Nonetheless, the reality in the ground (in the study area) was that most agricultural inputs such as improved varieties and agricultural implements were delivered subsidized low price by the regional government, research institutes. Thus, sedentarized households took credit to solve their immediate food shortage, other family needs and social obligations, not to purchase inputs. From individual interview and group discussions, it was observed that farmers seek short term credit service to purchase improved agricultural inputs, but have no access. This was practically indicated in low utilization of different agricultural inputs and low productivity per hectare of farm land and per animal head.

DISTANCE TO MARKET PLACE

Markets play a vital role in rural communities for they are a source for inputs and a place for sale of outputs. If the input-output market is closer, sedentarized households can have access to information, reduce cost of production and transaction, can easily purchase improved agricultural inputs, and display their output at fair price with good margin. The district has small livestock market at Beer Caano level and one common (large) livestock market is found in Gode town which around on average 70 km.

In the study area, after sedenterization households used to go a minimum and a maximum of 45 km and 70 km from their residence to reach the nearest market center, respectively. On average they have to travel 60,36 km to reach the nearest market center to sell their products and/or buy others. Similarly, the mean time required to reach the nearest market center was found to be 10,06 h.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The objective of this study was assessing the social consequences of sedentarized pastoral households at Beer Caano district of Shabelle zone, Ethiopia Somali regional state. The demographic features of sampled sedentarized households such as age, sex, educational status and household size were significantly affect social consequences and managerial implication of the settlers. TLU, annual income and land size were associated significantly with social consequences and managerial implications of the sedentarized pastoral households in the study area. Moreover, there has been slight change on traditional and cultural aspects after the resettlements program took place.

Generally resettlement program in the study area attained a positive impact on the resettlement program participant households' livelihood in improving livelihood physical asset, financial income, provision of social services like human health service from constructed health center in the study sites, health extension service at each *Kebele*, potable water service from shallow wells pump, agricultural extension service, veterinary health post service at each *Kebele*, availability of 1st-8th grade school in each *Kebele*, newly constructed modern small scale irrigation schemes and availability of traditional irrigation system facility in the study area. However, there is no availability of all-weather road connecting each rural *Kebele* of the study area and other resettlement site in the study area. The government has tried to reduce the role of male domination in the households' affairs with the assumption that male and female are equal.

RECOMMENDATION

Based on the finding of the study, the following points are recommended to tackle the negative impact of resettlement and to promote positive social consequences of sedentarization:

- poor rural infrastructure especially inadequate health services, transportation services and access to market for livestock were identified as major problems that can affect the livelihood of the settlers in the study area. Thus to overcome these problems the district administration in collaboration with the regional state, the settlers and other concerned bodies (NGOs), need to take corrective action in improving the social service and constructing rural infrastructure in study the area,
- the region needs to focus more on boosting value farm production in areas around the river basin and in the rain abundant areas so that to increase the food self-sufficiency in the sedentarized pastoral areas,
- agricultural and the livestock products should be commercialized for domestic and export and establishment of agro-business enterprises in the region,
- without infrastructure improvements, it is difficult to achieve the objectives of this policy and therefore, it is very crucial to focus on the development of road networks, communication system, electricity and banking system in the study area.

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NEW E-COMMERCE BUSINESS MODELS CAN BOOST ITS DEVELOPMENT: CASE OF NORTH MACEDONIA

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ABSTRACT

The Internet and new technology has transformed many business models and made new to appear. The advent of e-commerce has led to the creation of many new business models and affected the way of shopping goods and services. A new interesting business model that emerged in 2008 is the group-buying model. It was launched by Groupon, and very soon the concept attracted interest around the world and spread through the clones in many countries all over the world. In North Macedonia Grouper introduced this concept at the beginning of 2011, and few more group buying web sites emerged soon. The new business model initiated the revolution of the e-commerce in the country, a field that was rather disappointing so far. The goal of this article is to show that attractiveness of the deals offered by group buying site can influence the online shopping and ecommerce development. Secondary data research from relevant sources is done. The number of online transactions in 2011 rose for over 1200 % comparing to 2010 and one-third of these transactions were made by group buying sites. In the following years the number of Internet users who have made orders online constantly increases.

KEY WORDS

e-commerce, new business models, group buying model, North Macedonia

CLASSIFICATION

JEL: M39

INTRODUCTION

The Internet has become the most valuable tool of modern technology and quickly pulled in all spheres of society, anywhere in the world. It represents a major factor in the changes of companies' modern organization and an integral part of the trade. Internet access imposed inevitable opportunities for greater transformation of the conventional trade into electronic commerce, commonly known as E-commerce. E-commerce or doing business transactions online affected the economy and changed the face of business forever. By cutting costs, increasing efficiency and reducing time and distance, E-commerce became an important tool for development, especially for developing countries, since the scope for reducing inefficiencies and increasing productivity is greater in the developing countries. E-commerce has become one of the essential characteristics of the Internet era. E-commerce is a huge field with lots of different business practices, ways to market products and reach customers.

Many new interesting business models based on online selling aroused as a result of the opportunities that E-commerce offer. The new business model of group buying via daily deals, launched by Groupon, has proved remarkably successful and enjoyed massive growth in 2010 and continued to grow rapidly in emerging economies [1]. Hundreds of daily deal sites have been launched, some by large corporations and others by individuals. The model is developed as an intermediary between merchants and customers. Group buying model provides various benefits for both sellers and buyers. Sellers are merchants that use the new promotional tool for attracting new customers by giving great discounts and buyers are the end-customers attracted by the discounts. Accordingly, the new promising promotional tool should be accepted primarily by the businesses willing to offer products and services over 50% off of the regular prices, and then the customers will be incentivized to try the products or services and buy them online. In North Macedonia Grouper was the first to introduce the new trend of group buying, followed by few more sites soon after. The merchants easily accepted the model and customers could enjoy the great discounts. Despite the devastating facts presented by USAID in 2010 regarding the development of E-commerce in North Macedonia, the emergence of group buying web sites caused a revolution in this field.

The goal of this article is to show that the attractiveness of the deals offered by a group buying site can influence the rise of online shopping and development of E-commerce.

The number of online transactions in 2011 rose for over 1200% comparing to 2010. Proof of the group buying sites' contribution to the E-commerce development is its participation with one-third of the total number of online transactions. In the following years the number of Internet users who have made orders online constantly increases.

The rest of the article is organized as follows. Section 2 gives explanations on E-commerce, S-commerce, and the model of group buying, Section 3 depicts some facts about the situation in the field of E-commerce before and after launching group buying sites in North Macedonia and finally we conclude in Section 4.

BACKGROUND

E-COMMERCE

E-commerce is a huge field with lots of different business practices, ways to market products and reach customers. E-commerce consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks and thus offers advantages for consumers as: saving time, ease in finding particular product or range of

products, lower prices compared with traditional stores, avoiding crowds and lines, comparing prices, cutting transport costs to get to shops etc. Simply defined, “electronic commerce is a system of online shopping and information retrieval accessed through networks of personal computers” [2; p.29]. Raymond [3; p.411] defines E-commerce as “functions of information exchange and commercial transaction support that operate on telecommunications networks linking business partners (typically customers and suppliers)”. Unlike him, Damanpour [4; p.18] defines E-commerce as “any business activity that transforms internal and external relationships to create value and exploit market opportunities driven by new rules of the connected economy”. According to Turban et al. [5; p.4], “Electronic commerce is the process of buying, selling or exchanging products, services and / or information via computer networks, including the Internet”. This means that the e-commerce in general covers any products and services sold through the Internet. But with the development of technology, this definition can be extended, for example, with products and services sold through mobile devices. As Internet usage increases the volume of e-commerce transactions grows rapidly. Modern electronic commerce uses World Wide Web technology (www) mainly, but the electronic mail might be as well considered as technology used to do e-commerce. As a result, a wide range of trade is conducted electronically, using the innovations in electronic funds transfer, supply chain management for procurement, online transactions processing, electronic data exchange, and inventory management systems for systems for automatic data collection.

S-COMMERCE

Shopping is a social behaviour frequently performed with a companion, generally a family member or a friend [6]. Tauber [7] argues that customers do not always shop based on functional and rational reasons but also in many cases they go shopping due to non-functional reasons. He finds that main motives for shopping are the desire to communicate with others on similar interests, to share ideas about specific products, to seek the opinion of others and to enjoy leisure time with friends and family. However, sometimes it is difficult to shop in company because of the physical distance, e.g., two friends who live in different cities that can easily be overcome by buying online because in virtual malls friends do not have to be located on the same place. Rayport and Jaworski [8] suggest that the online consumers’ ability to communicate with each other is critical to the success of web-shops.

Social shopping is a buzzword that has gained attention in recent years. It is a combination of social media and E-commerce. In general, it covers all aspects of the social web: friends, groups, voting, comments, ratings, reviews and discussions and focuses on their favourite activity – shopping – in order to get social shopping. Social shopping is a method of e-commerce where the buyers’ friends are part of the act of buying. Social shopping uses technology to “mimic” the social interactions that occur when buying in physical stores and shopping centres. Social buying beat classic online buying because it brings all products in one place. Users no longer need to search web pages to find the desired product. In addition with social shopping the customer is only one click away of comparing products and prices and can easily find out what other users think about a particular product. Social buying attracted attention around the world, so, a study by SocialShop identified customers’ social needs and developed 6 types of social buyer based on those needs [9]. By breaking down traits associated with indulgent needs, impulsive needs, utilitarian needs and informational needs (Fig. 1), the researcher [9] identified the following (from light social shoppers to heavy users): Dollar Defaulter – shopper that has just one goal: to find the cheapest alternative, regardless of brand; Efficient Sprinter – shopper that will choose items based on their popularity and reviews, in order to simplify the shopping process; Quality Devotee – shopper

that uses social media to feel empowered in their purchases, using it to mould decisions and validate their choices, regardless of the time and effort involved, in order to find the best product available; Strategic Saver shopper that spends time ‘deal-digging’, to find their favourite brands at cheaper prices; Opportunistic Adventurer – shopper with impulsive shopping tendencies, everything is about scoring fun and unexpected deals, and are probably big fans of coupon sites; Savvy Passionista is the heaviest social shopping user, is indulgent and use social media to monitor trends, connect with brands and stay ‘in-the-know’ [9].



Figure 1. Social buyer’s needs [9].

Some of the features of social shopping websites are: comments and ratings of products, price comparisons, polls, advices, blogs, social trends (automated recommendations), wish lists and shopping deals/ promotional sections [10].

2010 was the year of “social shopping”, since it has reached its tremendous growth and development. Social buying is based on social networks, autosourcing and smart phones scanners. According to Macmanus [11] five major types of social shopping in 2010 are: daily deals; social buying in real time; locations checking; Facebook buying; and bar code scanning. The new kind of social buying via group buying daily deals made a huge boom. Although it does not contain the classical features of social shopping, it can be considered as social shopping because it emphasizes the power of the group, also called collective buying power.

GROUP BUYING

The group-buying phenomenon traces back to the 1860s. It was practiced in different ways and forms through time, long before the Internet was invented. Following the footsteps of traditional group buying (offline) and buying clubs, group buying with discounts represents a dynamic pricing mechanism or model that allows customers to aggregate their buying power and thus get lower prices that they would not be able to get individually. This dynamic pricing mechanism has been enabled due to the advanced information technology and was adopted primarily by Internet based companies. The dynamic pricing model enables online companies to adjust their prices according to how much the buyer is willing to pay. With regard to the data collected for the buyers, including where they live, what they buy and how much they spend, companies that implement this model are ready to respond to fluctuations in the market and customer demands. The most representative example of the application of the dynamic pricing model is the airline industry. In fact, this model is used to the point that almost all passengers on a plane pay different price for the same flight.

In November 2008, a new form of online group buying model emerged that attracted immense attention around the world and changed the group buying industry dramatically. Combining the power of the group, the social aspect of shopping and the huge discounts offered by merchants, Groupon.com is the pioneer that established the trend of group buying daily deals. The emphasis in this new form of online group buying is put on the term “daily deal”. Deal of the day can be any service or product that is offered at a discount of 50 % to 90 % off the regular price, which has to be bought by a certain minimum number of people in order to become successful. Buyers receive a coupon upon purchase that is redeemable for a service or product to the merchant. The coupon can be redeemed according certain conditions and in a predetermined time period defined by the merchant. Group buying sites are an intermediary between local businesses who want to promote their products or services at a discount in order to attract great number of new consumers to try their product or service. Daily deal services provide the merchants guaranteed number of new users of their services / products. Merchants in return pay a service fee in the form of commission from the price of the coupon. Users, on the other hand, make savings by buying with discounts and have the opportunity to visit new places and try new things. The group buying site has a predetermined minimal number of buyers that have to be purchased in order the deal to get tipped, or become successful, therefore they guarantee the merchant certain minimal number of customers. The buyer does not receive the coupon and is not charged until the deal gets tipped.

Coupons are one of the oldest means used by companies to attract huge numbers of different customers and reach bulk orders and are directly connected with the operating model of the group buying web sites. The business model is considered a combination of discount coupons and group buying [12]. Abrahamsen [13] claims as well that group buying contains all the features of the coupon as a marketing tool. Daily deals appear in the form of coupons or discount vouchers verifying that the buyer pre-paid particular service or product and should be redeemed at the merchant (the seller).

STUDY METHODOLOGY

The study methodology followed to complete the study is on the basis of secondary data. Secondary data were collected from relevant sources that are publicly available: State Statistical Office, National Bank of Republic of North Macedonia, Casys, and data from internal source: Grouper. A comparative analysis was done in the period before emergence of group buying sites and after to determine the the impact on the effective development of e-commerce in North Macedonia.

DATA AND RESULTS

The E-commerce appeared in the mid 90’s of the last century, and experienced a real boom in the last decade. In 2010 E-commerce accounts for 8 % of the total trade worldwide [14]. In the Republic of North Macedonia the data about the participation of the E-commerce in the total trade in 2010 is provided only in the study of USAID. About 1 % of the total transactions made online in 2010 are via domestic Internet merchants, according to a study of USAID [15]. Republic of North Macedonia lagged behind the developed countries in this matter because of several reasons: low internet penetration for many years; unavailability and further on low usage of payment cards; lack of choices where to buy from, since there were no North Macedonian online stores; most of the foreign online stores did not allow orders made with payment cards from North Macedonia, etc. The development of E-commerce in North Macedonia began several years ago, main reasons for that being the following: commercial banks started to issue cards authorized for online payment and to open accounts of the domestic online merchants; the legal framework for E-commerce has been adopted; reduced

number of frauds (transactions made with fake or forged cards); the number of foreign online stores that allow sales with payment cards from domestic banks has increased, etc. [15].

E-COMMERCE IN NORTH MACEDONIA BEFORE 2011

In the Republic of North Macedonia, in the first quarter of 2010, 46,1 % of households had Internet access at home, of which less than 5 % have made online orders for products and services. 84,1 % of enterprises from the financial and non-financial sector with 10 or more employees had Internet access [16]. The number of payment cards in circulation in North Macedonia is around 1,4 million [15]. The E-commerce turnover (buying from North Macedonian online merchants) in the first 10 months of 2010 amounts around 4 000 000 MKD (~ 65 000 EUR), while the E-commerce turnover from buying from foreign online merchants with payment cards issued in North Macedonia is 20 times higher [15]. Whether a card can be used for online payment depends on the bank's policy and whether the bank obtained a license from the international payment card organization. The bank does not open a separate account for the online merchant to perform E-commerce, but it requires the merchant to meet a series of conditions in order to allow him to deal with E-commerce (to obtain cash flows through Internet transactions). Most important is the assessment of the bank whether the potential Internet merchant promises serious approach to work. The number of interested merchants that gave up from the idea of opening online store was huge, after the bank gave them knowledge about all aspects of the E-commerce, which they did not take into account when developing the idea [15]. North Macedonians mostly used the Internet for general search for information, social networks, sending and receiving e-mail, following news, playing games, downloading music, etc. [17]. Based on a survey of 330 respondents, conducted by It.com.mk, a site whose visitors are IT and computer people, mistrust in online stores remains high [18]. 20 % of 330 respondents said they do not trust the sites, while 17,9 % said they would like to buy but do not know whether it is safe. Only 21 % of respondents said they would purchase from online stores. The majority of respondents, 41 % or 135 respondents said that they do not possess a payment card.

E-COMMERCE IN NORTH MACEDONIA BEFORE GROUP BUYING SITES EMERGENCE

Considering the factors that hinder online shopping such as the small number of internet merchants in 2010, and in accordance the small number of products and services offered for online purchase; the fear of safety when buying online; the small number of cards issued; and the unfavorable conditions offered by the banks to E-retailers, the overall picture of e-commerce in the country in 2010 was not very optimistic.

The turnover of E-commerce (buying from North Macedonian online merchants) in the first 10 months of 2010 was about 4 million MKD, while the value of transactions made on foreign internet retailers was 20-fold higher, which leads to the fact that North Macedonians show greater trust in foreign online stores than in domestic ones and that the supply from online retailers in the country is very low. Out of the total turnover in the country, only 8-10 % is made through payment cards, and out of these 8 %, online transactions account for only 1 % of the total payments made with credit cards, while other 7 % represent payments made on physical POS terminals [15].

Four subjects participate in the online transaction: merchant (internet retailer), customer (end user who performs the transaction), payment processing system (or payment processor) and bank (which is running the online transaction). Payment processor (payment gateway) is technical tool to the bank and links the bank with the international company that issues the payment card in order to process a transaction. Casys is one of the processing systems that

operate since 2002 in the Republic of North Macedonia. 14 of 17 banks used Casys for processing of transactions in 2010, regardless via POS or virtual terminals. 5 of those banks that cooperate with Casys offer processing of online transaction to the Internet merchants. Only 3 banks, of the total number of banks in North Macedonia, used other payment processor and only one of those three provides online processing to merchants (NLB Tutunska Bank) by using the online processing system from Slovenia – First Data. In absolute numbers according to data provided by the International Processing System – Casys in 2010 a total of 7 000 successful transactions online were realized, which represents disappointing data on the development of electronic commerce in 2010 [19]. The number of online transactions in 2010 is shown in Figure 2. It can be said that the sites for online group buying resulted from the economy recession. They appeared in North Macedonia in early 2011 and made a true revolution in the E-commerce. Consumers always prefer saving deals. According to a survey by Civic Consulting / TNS, in 2011, on a sample of 13 872 online buyers in Europe, the three most important reasons for online purchase are: lower prices (66 %), time-savings (50 %) and ability to compare prices (33 %) [20]. Daily deal sites are attractive for consumers mainly because of the great discounts, often over 50 % of the regular price.

The acceptance of the concept by consumers is shown by the growth in the number of subscribers of the group buying sites worldwide. Along with advances in technology and social media sites, group buying sites contributed to a change in consumer behavior, in particular the consumers' perception and purchase intention of online deals. In the beginning the daily deals were offered mainly from small businesses, later larger brands are present as well. This new promotional tool cannot be ignored, and more and more companies incorporate it in their marketing mix.

Group sites offer Win-Win-Win model that connects end-customers with retailers, as an intermediary that provides discount. Figure 2 shows that almost 36 % out of 11 000 total numbers of online transactions realized through C-Pay Payment Gateway in 2010 amounts were unsuccessful.

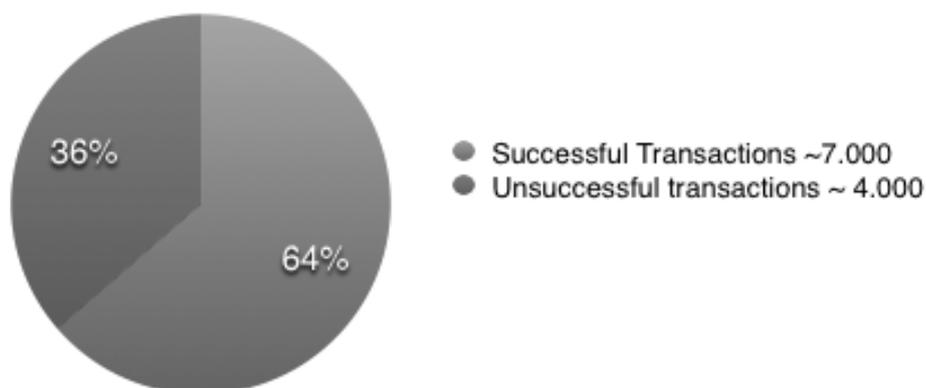


Figure 2. Online transactions realized via C-Pay Payment Gateway in 2010 [19].

E-COMMERCE IN NORTH MACEDONIA AFTER GROUP BUYING SITES EMERGENCE

The number of issued payment cards is an important prerequisite for the development of electronic commerce. According to the official annual report of the National Bank of Republic of North Macedonia for 2011, the total number of cards in circulation was 1450 340, which is an increase of only 2 % compared to the number of issued cards, 1422 339, in 2010 [21]. In the first quarter of 2011, 55 % of individuals used Internet [16]. 6,7 % of the total number of

Internet users aged 15-74 made online orders in 2011. Compared to 2010, the increase is less than 2 %, however growth is significantly greater having in mind the considerable increase in the number of Internet users in absolute numbers. The number of customers who ordered online increases as the number of Internet users increases in the following years as well, Table 1.

In 2011 through cPay Payment Gateway a total of 97 177 transactions were realized, and 85 017 of them were successful transactions [19]. The number of online transactions depicting successful and unsuccessful in 2011 is shown in Figure 3, and unlike in 2010 only 13 % were unsuccessful.

One-third of the total number of online transactions in 2011 was made via group-deal sites, according data from C-Pay Payment Gateway [19]. From the transactions made via daily deal sites, 55 % represents Grouper or 18 % of the total transactions processed online. Other deal sites, six sites in particular that were launched few months after Grouper, account for the other 45 % of the online transactions [22]. This indicates the impact of group discount sites on the development of the E-commerce in the country, and especially Grouper, which holds the largest share of the group buying market, Figure 4.

Table 1. Internet users aged 15-74 and the Percentage of them that made orders/bought online. Source: State Statistical Office.

	2010	2011	2012	2013	2014	2015	2016
Internet users (15-74) in the last 12 months	46	55	60	66	70	73	75
Ordered online in the last 12 months (percentage of users aged 15-74)	5	7	8	16	16	20	20



Figure 3. Online transactions realized in 2011 through Cpay Payment Gateway [19].

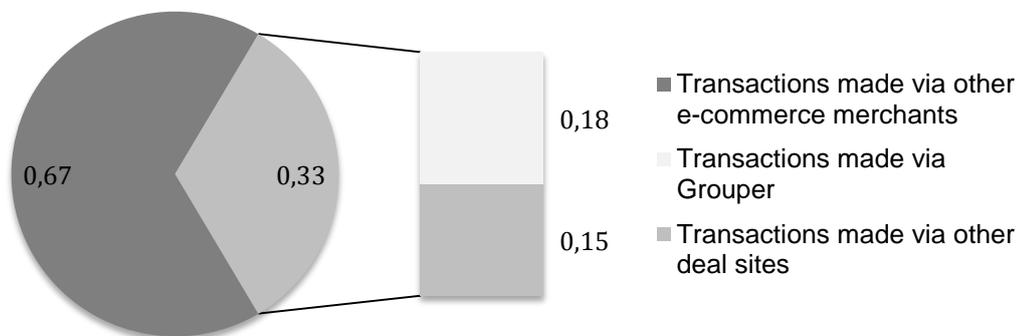


Figure 4. Online transactions realized in 2011 via group deal sites and other E-commerce companies [19].

The group buying sector gained significant attention, and an additional proof of that is the fact that several group deal sites aggregators were launched just a few months after the emergence of the group deal sites [23]. Some of the aggregators are: Popust.be, Bagatela.mk and Eftino.mk.

The banks recognized the contribution and they provided users with easy online application form for acquiring a debit card, to create awareness of the process of getting a payment card.

In 2011 Grouper reached about 15 000 successful online transactions [22]. If we compare this figure with the total number of successful online transactions, including online payment of bills and transactions of mobile operators we can clearly conclude that the first online group buying, Grouper is one of the major players in the E-commerce accounting for approximately 18 % of the total E-commerce industry.

CONCLUSION

This article explains E-commerce setting in Republic of North Macedonia before and after the emergence of group buying sites. Despite the measures and activities started by the Ministry of Information Society (MIS) in order to identify problems and opportunities in the field of E-commerce and initiating actions for their resolution in 2008, the situation in 2010 is still on a very low level.

Group-buying sites have significantly influenced the online buying in North Macedonia, as a significant part of the E-commerce sector. Along with advances in technology and social media, online group buying contributed to the change in consumer behavior or the way consumers perceive and buy online deals. In fact, the increased awareness of online shopping is due to the attractive offers that affect the “pocket” of citizens. It can be said that the emergence of group deal sites led by Grouper as a pioneer in this field, showed to be an excellent trigger for the development of E-commerce in times of economic crisis when everyone is looking for ways to save. In 2011 group deal sites made a true revolution inducing increase of 1200 % of the online truncations in 2011 comparing to 2010. One-third of the total number of online transactions is made via group deal sites. In the following years the number of Internet users who made online orders is increasing. Finally North Macedonian citizens made their first online purchase on discounted prices via group deal sites as the major motivator to buy. This proved that the attractiveness of the offer and the desire to save were sufficient drivers to overcome most of the obstacles that hamper online buying.

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