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ABSTRACT

The coordination frameworks measure coordination as an index of six dimensions of top management commitment: mutuality, relationships and decision making, information flow, organizational factors; and responsiveness. These six dimensions present mainly micro internal factors from the management environment and put little emphasis on market and macro environment dimensions. Although the existing frameworks offer a good platform for measuring and improving understanding of concepts underlying coordination mechanisms, they have limited capacity to analyze coordination interactions within the health sector, especially in developing countries like Uganda. Using the business management environment framework, this paper surveys the literature for cases on supply and distribution of Artermisinin-based Combination Therapies for malaria. The findings serve as a platform to argue for revisiting coordination dimensions in view of conditions that include a resurgent market and macro environment in developing countries. The insight raises implications for extending coordination frameworks that are geographically focused, and specific to ACTs. It may influence policy direction in this regard and thus contribute to the body of knowledge.

KEY WORDS: Coordination, framework, distribution, ACTs

INTRODUCTION

Supply-chain coordination is defined in various ways, but what is common to most of the definitions is that it is the process of managing interdependencies, flow of products, resources, and information among channel partners for achieving better supply and distribution of a goods and service delivery to end users (Akhta, 2012; Balci et al., 2010; Moharana et al., 2012; Crowston, 1997; Malone and Crowston; 1994). In an effort to manage the interdependencies and flow of goods and services, several scholars have developed different measures of supply-chain coordination known as coordination frameworks (Li & Wang, 2006; Fugate, et al., 2006; Singh, 2011; Arshinder, Kanda & Deshmukh, 2009). Although there are differences, in general the coordination frameworks emphasize similar dimensions that belong to the micro environment, with little emphasis on the market and macro environment. Much more than internal coordination, case evidence from previous studies shows that supply and distribution of Artermisinin-based Combination Therapies for malaria (ACTs) in developing countries is shaped by complex alliances between stakeholders from government, donors, patients' associations, interest groups and other private organizations (Jahre et al., 2012; Kraiselburd & Yadav, 2012; Moradeyo, 2012).

Notwithstanding the great coordination platform laid by proponents of coordination frameworks, the studies offer a boundary condition that is limited to micro dimensions. The limited micro dimensions offer little understanding of coordination in the distribution of drugs, especially in developing countries, where medical drug distribution is shaped by macro and market influences. Ignoring market and macro dimensions in assessing coordination creates loopholes; closing these could improve drug availability, reduce stock outs and even combat the malaria death rates reported by previous studies (WHO Report, 2013; ACTwatch, 2013; Tumwine et al., 2010). This study therefore aims to extend the coordination frameworks by offering case evidence that clearly provides an insight into supply-chain management in the medical industry in Africa. Specifically, the paper seeks to incorporate the market.
and macro perspective into the coordination framework for ACTs. To consolidate the argument, the paper supplies an analysis of coordination frameworks and classifies each framework by comparing it with the management environment. Drawing from published case studies about distribution of ACTs, the study clearly addresses the question of how market and macro dimensions influence the distribution of ACTs drugs in Africa. It is from this case evidence that the study pinpoints the market and macro environment implications in developing countries. Incorporating the market and macro environment augments the assessment of existing coordination frameworks.

The extensions contribute to both the body of knowledge and supply-chain practices in the medical industry. As regards knowledge contribution, the study provides a conceptual extension of the framework to assist with better assessment of medical drug coordination. In practice, as mentioned above, this may reduce medical drug stock-outs, improve drug availability, and might lead to possible combat of the malaria death rate through better supply chain management in the medical sector.

The micro, market and macro environment are part of the major management environment discussed in detail by previous studies (Niemann & Bennett, 2002; Fahey & Narayanan, 1986). The major implications arising from these environments are that businesses may be influenced by several variables emanating from one environment, or sometimes a combination of them all. The micro environment includes factors such as resources (capital, labour, etc.), business strategies (policies, aims and objectives), and business functions (logistics, marketing, operations, etc.). Secondly, from the market environment; there are stakeholders (employees, shareholders) and role players (customers, suppliers, competitors, new entrants, opportunities and threats).

Lastly, in the macro environment are political, economic, technological, physical and environmental factors. The aim of this study is not to dwell much on the management environment, but rather to demonstrate how the existing coordination frameworks exclude macro factors and some market factors in the evaluation of supply chain coordination, especially in developing countries. To help contextualize coordination frameworks, a detailed review of co-ordination frameworks is offered in the subsequent section; this is followed by qualitative research methods that have helped to assess the dimensions of coordination frameworks and their links to the management environment framework. Finally, the paper recommends a new perspective of the coordination framework by amending it from the market and macro environment viewpoint.

**LITERATURE REVIEW**

**Coordination frameworks**

A number of coordination frameworks have been published and embraced across different scholarly disciplines over the last two decades (Singh, 2011; Chopra and Meindl, 2010; Balcik, et al., 2010; Crowston, 1997; Malone and Crowstow, 1994; Galbraith, 1973; Mintzberg, 1979; Arshinder, Kanda & Deshmukh 2009; Xu and Beamon, 2006). These frameworks have made significant contributions in understanding and analyzing different cases in the private sector (Akhtar et al., 2012; Shukla et al., 2013; Ballou et al., 2000), though with little focus on ACTs. Notable among the frameworks is one that was developed by Singh (2011). However, Singh’s (2011) study was carried out among Small and Medium Enterprises (SMEs) in India, and findings indicate that top management commitment was the greatest predictor of coordination. Hayat et al. (2012) investigated three manufacturing firms in Pakistan and found both top management and information sharing as better predictors of coordination.

Another framework developed by Yuan (2006) was based on the aerospace industry; a conceptual framework was developed after analyzing inter-enterprise coordination in the supply chain. In the textile industry, it was observed that the most critical factor was top management’s vision, followed by support and commitment. This finding differed somewhat from those
in the literature, in which most researchers mentioned trust and information technology as the lead factors in supply-chain coordination (Phong-arjarn & Jeenanunta, 2011). Apart from Singh's widely applied coordination framework, some coordination frameworks have also been adopted for humanitarian relief chains in support of relief missions (Balcik, et al., 2010). A supply chain as defined by Ballou et al. (2000) comprises interdependent units within a firm and across units external to the firm that belong to both downstream and upstream partners. In view of the nature of the interdependence between units and activities, coordination is a necessary requirement to integrate operations to achieve the goal of the supply chain as a whole (Simatupang et al., 2005). However, Soroor and Tarokh (2009) argue that success of coordination will depend on the ability to manage dependencies in times of uncertainty by both the internal and external value-chain actors (although the external parties were not explicitly defined).

From table 1 below, it is evident that most of the existing coordination frameworks put little, if any, emphasis on external actors. The major extension to external factors is mainly limited to market factors, and not much on macro factors. The limited emphasis on external actors serves as a foundation for this study, which relates coordination frameworks not only to micro factors, but also to market and macro factors, especially in developing countries. Table 1 gives a comprehensive analytical and comparative overview of the disparities in existing coordination frameworks and situates its focus on the management environment.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Coordination framework</th>
<th>Dimensions measured</th>
<th>Discipline</th>
<th>Methodology used</th>
<th>Findings</th>
<th>Micro links</th>
<th>Market links</th>
<th>Macro links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh (2011)</td>
<td>Coordination index</td>
<td>6 dimensions of: top management commitment; mutuality; joint decision making and relationships; information sharing; responsiveness</td>
<td>SCM</td>
<td>Coordination index using a case study</td>
<td>Top management commitment is a major driver for improving the coordination of the six factors. Expert opinions were sought</td>
<td>Firm</td>
<td>Suppliers</td>
<td>Dimensions measured</td>
</tr>
<tr>
<td>Arshinder, K., Kanda, A. and Deshmukh, S.G. (2009)</td>
<td>Supply chain coordination index using surrogate measures</td>
<td>Contracts information technology and information sharing and other collaborative initiatives</td>
<td>SCM</td>
<td>Dimensions measured</td>
<td>There is a need to identify the coordination mechanisms which helps in addressing the uncertainty in supply chains</td>
<td>Firm</td>
<td>Manufactures and retailers</td>
<td>None</td>
</tr>
<tr>
<td>Phong-arjarn and Jeenanunta (2011)</td>
<td>Coordination framework</td>
<td>Information Sharing (IS), Decision Synchronization (DS), Joint Supply Chain Processes and Resource and Skill Sharing (RS)</td>
<td>SCM</td>
<td>Dimensions measured</td>
<td>The most important factors: Top Management’s Vision followed by support and commitment</td>
<td>Firm</td>
<td>None</td>
<td>Dimensions measured</td>
</tr>
<tr>
<td>Xu and Beamon (2006)</td>
<td>Attribute based approached</td>
<td>Resource sharing; Decision style; level of control, risk or reward sharing</td>
<td>SCM</td>
<td>SCM</td>
<td>Future research should specify what other mechanisms, if appropriate, should be implemented and determine how the recommended mechanisms should be implemented for a given situation</td>
<td>Firm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ballou et al (2000)</td>
<td>Coordination framework</td>
<td>Formal (using power trust) and formal (performance metrics, sharing of information and allocation of rewards.</td>
<td>SCM</td>
<td>Illustrative case studies</td>
<td>Coordination beyond the immediate function is difficult but offers promise of yet under explored opportunities</td>
<td>Within and between functions</td>
<td>Between firms</td>
<td>None</td>
</tr>
<tr>
<td>Shukla, Garg and Agarwal (2013)</td>
<td>Modelling supply chain coordination</td>
<td>Information technology; joint decision making; information sharing and resource sharing</td>
<td>SCM</td>
<td>A case study automotive parts manufacturing company</td>
<td>Trading partners is determined as the most important criterion for coordination</td>
<td>Within firm</td>
<td>Between firms</td>
<td>None</td>
</tr>
<tr>
<td>Datta and Christopher (2010)</td>
<td>Coordination framework using simulation</td>
<td>Information sharing</td>
<td>SCM</td>
<td>Case study</td>
<td>Information sharing across different members is found to be essential in managing supply chains effectively under uncertainty</td>
<td>Firm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Reference</td>
<td>Coordination framework</td>
<td>Dimensions measured</td>
<td>Discipline</td>
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<tr>
<td>Simatupang and Sridharan (2005)</td>
<td>Integrative collaborative frameworks</td>
<td>(1) A Collaborative Performance System (CPS); (2) Information sharing; (3) Decision</td>
<td>SCM</td>
<td>Case studies</td>
<td>Integrated supply chain processes are necessary preconditions for</td>
<td>Firm</td>
<td>Retailers, suppliers and customers</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>synchronization; (4) Incentive alignment; and (5) Integrated supply chain processes</td>
<td></td>
<td></td>
<td>coordinated outcomes</td>
<td></td>
<td></td>
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<tr>
<td>Fugate, Sahin and Mentzer (2006)</td>
<td>Coordination framework inter firm</td>
<td>Price coordination: Non price coordination; flow coordination</td>
<td>SCM</td>
<td>Empirical case study</td>
<td>Managers prefer flow coordination mechanisms over price and non-price</td>
<td>Firms</td>
<td>Suppliers and customers</td>
<td>None</td>
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<tr>
<td></td>
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<td></td>
<td>coordination mechanisms</td>
<td></td>
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<tr>
<td>Chen and Yuan (2006)</td>
<td>Coordination framework in the Aerospace</td>
<td>Information sharing, contract and incentives, collaboration and trust, collective</td>
<td>SCM</td>
<td>Dimensions measured</td>
<td>Developed a conceptual framework of coordination in the aerospace industry</td>
<td>Firm</td>
<td>Buyers and suppliers</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>learning</td>
<td></td>
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<tr>
<td>Thompson (1967)</td>
<td>Organisational framework i.e. standardization or rules, plans and schedules, mutual adjustment</td>
<td>Organisational design</td>
<td>Organisational design</td>
<td>Case studies</td>
<td>Focused on role-based coordination rather than individual ties (groups were the main focus). Thompson notes that dependencies can either be competitive or facilitative</td>
<td>Within organisations</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Malone and Crowston (1994)</td>
<td>Organisational framework</td>
<td>Decision making, communications and development of shared understandings and collective sense making</td>
<td>Organisational design</td>
<td>Case studies</td>
<td>Focus on dependencies between tasks and not individuals. Focuses attention on cause for a need to coordinate, rather than on the desired outcome of coordination.</td>
<td>Firm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Van de Ven, Delbecq and Koenig (1976)</td>
<td>Organisational framework</td>
<td>Impersonal (plans and rules); Personal (vertical supervision); Group (formal and informal meetings) and Teams</td>
<td>Organisational perspectives</td>
<td>Case study</td>
<td>Hypothesized that tasks are worked on jointly and simultaneously. Emphasized group coordination</td>
<td>Firm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Gittell (2011)</td>
<td>Relational coordination using a network approach</td>
<td>Impersonal (plans and rules); personal (vertical supervision); group (formal and informal meetings) and teams. Shared goals, shared knowledge, mutual respect, frequent communication, timely communication, accurate communication, problem-solving</td>
<td>Organisational perspective</td>
<td>Case studies</td>
<td>Coordination is not only the management of interdependence between tasks but also the management of interdependence between the people who perform those tasks</td>
<td>Within firms</td>
<td>Multiple providers are engaged in carrying out highly interdependent tasks under conditions of uncertainty and time constraints</td>
<td>None</td>
</tr>
</tbody>
</table>
From the analysis presented in Table 1 above, two things can be deduced:

1) It is evident that research on supply chain coordination frameworks is widely applied in manufacturing and retail private sectors;

2) Not much research is available on supply-chain coordination in the public sector.

In order to demonstrate the geographical context of how the market and macro environment add to the micro dimensions presented in Table 1 above, the study presents in the next section case studies on supply and distribution of ACTs that highlight the implications arising from market and macro environment.

METHODOLOGY

Case selection and time period

The literature review of cases draws upon the mainstream coordination frameworks by different scholars that take into account coordination organizational designs as well as supply chain coordination frameworks. All the frameworks typically focus on either developed countries or emerging economies; specifically in the private sector. Content analysis was used and the period presented in this study is from 1960 to date. Within the specified period, this study analyses the coordination framework from organizational researchers such as Thompson (1967) and Malone and Crowston (1994). Important to note is that leading journals are used, as these are believed to impart current trends and are held in high esteem (Üsdiken, 2014). The focus of this study is Africa, as it falls within the developing countries classification (Nielsen, 2011).

The study reviews coordination frameworks used in the supply and distribution of ACTs. Therefore from a critical realist stance, this study reviews previous studies that have applied coordination frameworks, from which 20 case studies have been purposively selected within Africa, with implications linked to the market and macro environments. The purpose of this qualitative approach is to identify only those studies that concern ACT supply and distribution in Africa. Therefore, the focus of this study is to use the coordination theory as a basis for making generative models (i.e. models that suggest interplay between alternative ways in which a process could work using the micro, market and macro environments).

The rationale behind focusing on publications from 1967 to date is to provide a critical analysis of the theoretical frameworks on coordination since the days of Thompson (1967), as this demonstrates how the dependencies have been coordinated in supply-chain management and also whether the frameworks have aptly addressed linkages between the micro, market and macro environments that may have influenced the supply and distribution of ACTs in developing countries. Most of the research papers reviewed were extracted from the journal sources such as Emerald, Sage, Business & Industrial Marketing and the Academy of Management Review. Other publications were published by the United States Agency for International Development with affiliations to health logistics.

Also reviewed were published reports and scientific publications from Malaria Journal. The journal provides research on several drug-efficacy studies conducted, with examples from Uganda, Tanzania, Kenya, Malawi, Sudan, Ghana and Nigeria, among others in Africa, from 2005 to date. These were selected purposely to document how coordination frameworks are influenced by macro factors in developing countries in the supply and distribution of first-line antimalarial drugs for uncomplicated malaria (ACT). For experiences on the implementation of the policy, the researchers reviewed several reports and publications by different groups of people who conducted studies to assess whether the level of implementation of the new policy considered the interactions of the micro, market and macro environments.

Sampling

A purposive structured search of literature is considered appropriate for both organizational and supply-chain
management in order to create a solid theoretical framework by selecting respected journals using key words for state-of-the-art articles on the search subject. The forward search selected articles with relevant references from selected journals. All the top journals are in the database of ‘Web of Science’. First, respected journals were selected by looking into the rankings of management journals (Saunders 2001) of which there were 15. The researchers then narrowed down their search using keywords at the ‘Web of Science’. The key words searched were translated into one query: “coordination or coordination frameworks”. This particular search was on articles published in the last 40 or so years.

This was done for two reasons. The first was to cover the trends on the subject and the second reason was to narrow down the subject matter. The search resulted in more than 50 articles. Based on the predetermined criteria, relevant articles were selected for analysis. The papers were written in English. The study covered coordination frameworks of departments or groups within or external to the organization (checking out for micro, market and macro environmental links) and the study was carried out in country/region of interest (Africa).

The next step was a backward reference search for articles concerning ACTs. By reviewing citations of articles identified in step two, over 40 articles were found, with 20 articles matching the same selection criteria. It should be noted that it was very difficult to find articles that were directly concerned with coordination frameworks for ACTs per se. Such articles were obtained from the Malaria Journal from 2005 onwards. The period was chosen because 2005 was when the majority of malaria-endemic countries in Africa adopted the highly efficacious artemisinin-based combination therapy (ACT) as their first-line treatment recommendation for uncomplicated malaria.

All the articles were imported into EndNote reference software, which enabled a structured search into articles and other references. Using this software not only ensured entry of highly referenced data, but also the type of article, keywords, summary, and label for quick reference. In the final step, articles were downloaded (where possible) and read. Unfortunately, not all the articles were accessed because of lack of subscription to journals or because sections of the books in which the article was published were not available in the library database. Another group of articles that matched the selection criteria based on the abstract were also removed from the sample, because when examined the content did not match these criteria.

Finally, a group of 14 articles was selected for further analysis, as seen in Table 2. In the group of selected articles discussing coordination or coordination frameworks, an analysis for comparison was done. Table 2 presents the profile of the case studies specific to ACTs in Africa that were reviewed. Apart from the references, the columns present the different dimensions of coordination, quotes from the case studies, country studied and the threads to the management links.

Coding

Articles were coded in terms of three categories: (1) year of publication; (2) country location of authors’ institutional affiliations; and (3) African orientation. Data on author affiliations was extracted to a large extent from the information provided in the journals. When this was missing, a thorough search was conducted on the web and publication databases. Complete affiliation data was gathered for all the articles in the selected sample. A binary version of this coding (no citations vs. at least one citation) was used in the analyses. Journal region was specified by grouping the journals as African-oriented (Malaria Journal); European oriented (Emerald); and American oriented. The second and third groups were mainly used when studying coordination frameworks in supply-chain management generally, while the first was used to derive evidence from the African context regarding supply and distribution of ACTs. Year of publication was used to divide the articles into two perspectives, i.e. organizational and supply-chain perspectives as shown in Table 1. The articles reviewed are those that were published from 1967 to 2010.
Analysis

The literature reviewed in this paper took a step in the direction of examining whether there were interactions between micro, market and macro environments within the supply chain management and general organizational designs. Using content analysis in Table 1, it is clear that many of the existing frameworks have limited capacity to analyze the interactions between different elements of market and macro environment in the public sector. The analyses also examined the dimension used for measuring coordination. In both perspectives (organizational design and supply-chain management), coordination framework falls into the following seven themes as follows: top management commitment; mutuality; joint decision making and relationships; information sharing, contracts, responsiveness and standardization plans. Unfortunately, there was no coordination framework linked to the macro environment. Further quotes were extracted from the different articles and reports as indicated in Table 2.

Results

From Table 2 we note that the coordination frameworks for supply and distribution of ACTs demonstrate interplay of all the business management links that describe and analyze the supply and distribution of ACTs. It therefore calls for such elements to be taken into account. Successful coordination frameworks should be inclusive of all forms of joint work from the micro, market and macro environments. Table 3 below presents the profile of the case studies reviewed.
### Table 2: Interplay of Micro, Market and Macro Coordination Frameworks for Supply and Distribution of ACTs Based on Case Studies in Africa

<table>
<thead>
<tr>
<th>Reference</th>
<th>Case study</th>
<th>Quotes from case study</th>
<th>Country</th>
<th>Micro Links</th>
<th>Market links</th>
<th>Macro links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dalrymple (2010)</td>
<td>Several country case studies in developing countries</td>
<td>Malaria is a cross-border affliction of global magnitude. Key components are national policies toward adoption and subsidy programs (p40)</td>
<td>Tanzania, Uganda, Kenya among others</td>
<td>Health facilities</td>
<td>Local farmers, distributors (wholesalers and retailers), producers, research and development, pharmaceutical firms (p56-57)</td>
<td>Foundations and other donors, government policies, public and private sector (p56-57)</td>
</tr>
<tr>
<td>Ongolo-Zogo &amp; Bonono (2010)</td>
<td>Policy dialogue case study</td>
<td>Who recommends comprehensive coordination frameworks contextualized to relevant social and community organisations, to improve access to malaria drugs (p237)</td>
<td>Cameroon</td>
<td>National Committee to Roll Back Malaria, recommends home-based management of malaria (HMM) to improve access and reduce delays in treatment (p240)</td>
<td>Engage private pharmacists in the distribution of subsidized ACTs. Engaging the private pharmacist as public health agent (p239–240)</td>
<td>Strengthen the stewardship and regulatory role of the Ministry of Health to ensure the proper registration, regulation, and use of ACTs (p239–240)</td>
</tr>
<tr>
<td>USAID / Deliver Project (2010)</td>
<td>Various case studies</td>
<td>Critical to set up of in-country logistics management systems to coordinate or collaborate with stakeholders involved in financing, procuring or distributing commodities (p14)</td>
<td>Zambia, Zimbabwe, Tanzania</td>
<td>Establishment of a logistics management unit to manage the product selection, quantification and procurement, inventory management (p7)</td>
<td>Suppliers, distributors (third party logistics), warehouses (central medical stores) (p8)</td>
<td>Central government level (MoH, Provincial Health Offices, Districts) implementing partners, donors / funding agencies, NGOs, local regulatory authorities, medicine planning and selection unit (p8)</td>
</tr>
<tr>
<td>Roll Back Malaria (RBM) partnership / United Nations Development Programme (2013)</td>
<td>Various case studies</td>
<td>Multisectoral Action Framework is needed to reduce the malaria burden. It stresses creation of synergies through complementarity as well as emphasising coordination</td>
<td>Zambia, Zimbabwe, Tanzania, South Sudan, Kenya</td>
<td>Household surveys, designed to produce data that are comparable over time</td>
<td>Research institutions and private sector organisations critical in availing ACTs</td>
<td>Coordinated action among different development sectors to tackle the disease, which exacts its deadliest toll in sub-Saharan Africa. Coordination among implementing partners such as national malaria control programs, donors, USAID and President’s Malaria Initiative (PMI) staff, research institutions and private sector organisations</td>
</tr>
<tr>
<td>Reference</td>
<td>Case study</td>
<td>Quotes from case study</td>
<td>Country</td>
<td>Micro Links</td>
<td>Market links</td>
<td>Macro links</td>
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<tr>
<td>Yeka et al (2013)</td>
<td>Country case study</td>
<td>Public health facilities alone in provision of ACTs, are not adequate. Inclusion of the private sector in healthcare provision will complement public sector and community-based treatment channels (p9)</td>
<td>Uganda</td>
<td>Health centers and village health teams, lack of effective supervision, high attrition of staff at health centers, irregular availability of drugs and other supplies and poor coordination and leadership (p13)</td>
<td>Providing subsidized ACTs through the private sector can lead to a dramatic improvement in the availability (~70% market share) of effective treatment and the level of uptake (p9)</td>
<td>Coordination of malaria is most effective and attainable through the Interagency Coordination Committee for Malaria (ICCM), with technical working groups with broad participation from government departments, development partners, civil society and the private sector (p11)</td>
</tr>
<tr>
<td>Talisuna et al (2012)</td>
<td>Case studies of four districts</td>
<td>Failure of coordination increases burdens on already pressured national institutions</td>
<td>Uganda</td>
<td>Case management access target that 80% of patients who are supposed to receive treatment within 24 hours of symptom onset (p12)</td>
<td>Incentivizing suppliers to deliver, strengthening community based systems and ensuring sufficient licensed outlets to meet demand is critical (p12)</td>
<td>Ministry of Health (MoH), National Drug Authority (NDA) and other and the district health officers of the pilot districts (p4)</td>
</tr>
<tr>
<td>The US Agency for International Development (USAID) / President's Malaria Initiative (PMI) (2011)</td>
<td>Country case study</td>
<td>Information sharing among donors, the NMCP leadership and staff members will be an important element to consider in supporting coordination efforts (p36)</td>
<td>Democratic Republic of Congo (DRC)</td>
<td>Training and supervision of health workers at the facility level (p34)</td>
<td>Local farmers, distributors (wholesalers and retailers), producers, research and development, pharmaceutical firms (p56-57)</td>
<td>Regular meetings and technical assistance for coordination and annual review of activities (p34). National level communication and coordination mechanisms: the Donors Group, the Global Fund, Country Coordinating Mechanism (CCM) and the Malaria Technical Working Group (p35)</td>
</tr>
<tr>
<td>Alba et al (2010)</td>
<td>Two case studies</td>
<td>The public health and private retail sector complement each other to ensure the availability of ACTs for successful uptake (p14)</td>
<td>Tanzania</td>
<td>ACTs can be maximised by making drugs available at affordable prices in the private pharmacies (p14)</td>
<td>Major gains were made in the private retail sector in terms of availability and accessibility (p11)</td>
<td>Deliver of anti-malarials needs to be supplemented by additional distribution mechanisms (p2)</td>
</tr>
<tr>
<td>Watsierah and Ouma (2014)</td>
<td>Cross sectional survey</td>
<td>Access to malaria treatment is clearly influenced by multiple factors occurring at both the supply and the demand level (p6)</td>
<td>Western Kenya</td>
<td>Outlets’ staff should be trained in unbiased manner on the current malaria policy to improve drug use in the community (p6)</td>
<td>The role played by the private sector in providing treatment for patients in Western Kenya, it is important to effectively increase ACT (p6)</td>
<td>The government needs to regulate and implement price policies to protect the most vulnerable groups from exploitation by establishing effective surveillance mechanisms (p6)</td>
</tr>
<tr>
<td>Reference</td>
<td>Case study</td>
<td>Quotes from case study</td>
<td>Country</td>
<td>Micro Links</td>
<td>Market links</td>
<td>Macro links</td>
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<tr>
<td>Chuma, Okungu and Molyneux (2010)</td>
<td>Four case studies</td>
<td>Access to malaria treatment is clearly influenced by multiple factors occurring at both the supply and the demand level (p10)</td>
<td>Kenya</td>
<td>Educate people &amp; improve communication skills for health workers; strengthen transparency and accountability of health services to the community (p12)</td>
<td>Take services close to the people through mobile clinics and outreach programmes</td>
<td>The government should work closely with health workers, district health management teams and health facility committees to ensure availability of ACTs (p13)</td>
</tr>
<tr>
<td>Mutabingwa (2005)</td>
<td>Case study</td>
<td>Concerted efforts of multilateral organisations, the local scientific community with involvement of policy-makers progress will be registered on provision of ACTs (p306)</td>
<td>Uganda</td>
<td>Strengthening (personnel, resources and infrastructure) of institutions in malaria endemic countries (p313)</td>
<td>Active involvement of scientists in International Scientific Forums (p306)</td>
<td>Clear policies on external funding and minimal politics within funding agencies are required. Increased public and private sector partnership are critical. ACTs are to be made available in poor malaria endemic countries (p306)</td>
</tr>
<tr>
<td>Wild and Cammack (2013)</td>
<td>Country case study</td>
<td>Chronic shortages of medicines reflect issues of resourcing, along with other sectors, resulting from the country’s broader economic climate (p2)</td>
<td>Malawi</td>
<td>Establish drug committees in health facilities to monitor delivery and distribution of medicines (strengthen bottom-up monitoring mechanisms) in facilities (p4)</td>
<td>In addition to drug committees in health facilities, involvement of selected community members (chiefs), to monitor delivery and distribution of medicines, is critical (p4)</td>
<td>There is potentially real shared interest between government, development partners, civil society and others to better understand district-level processes to improve performance (p5)</td>
</tr>
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</table>
From the analysis in Table 2, micro links seem to focus on individual health units in which training of staff, setting clear levels of communication and enhancing cultural change are the norm. At the facility level coordination is important to manage the selection, quantification (or forecasting), procurement, inventory management, storage, and distribution of ACTs. All of these functions must work together to ensure supply meets demand. However, Dowling (2011) observes that within a country, the above functions may operate at different levels: central, regional/district, and service delivery points. In addition, various vertical supply chains may be operating within a country, with many points of intersection and overlap and a diverse set of stakeholders. For example, funding is a key component of the supply chain. Its availability determines what supplies can be procured, and where and when supplies can be distributed to ensure optimal performance. Therefore, a coordination framework focusing on public health facilities alone in provision of ACTs is not adequate. Possibly, inclusion of other stakeholders external to the health facility may complement public sector and community-based treatment channels.

Within the market link, many actors and organizations interact with one another. In view of the above, actors and their interrelations (suppliers, manufacturers, wholesalers, and retailers) play a central role, proactively coordinating through regular meetings, and developing joint research and educational plans. Watsierah and Ouma (2014), in addressing the supply and distribution gap in this link, propose broad interventions such as the creation of public-private partnerships in the procurement and distribution of recommended anti-malaria drugs. Indeed, the “Roll back malaria harmonization working group” (2014) argues for the need for a well-built coordination framework to tackle ACT’s complex partnerships and subnational programmes. Asamoah, Abor, & Opare (2011), on the other hand, propose forming strategic alliances between the organisation and suppliers, manufacturers and distributors (farmers, manufacturers, pharmacies and chemist shops) to produce and market ACTs. However, this mechanism may be hard to realize, due to individual goals pursued by different stakeholders, especially in the absence of incentives.

In the macro environment, there seems to be a wide spectrum of joint agency activity taking place in the supply and distribution of ACTs in developing countries. Several dedicated individuals/stakeholders interact every day in the form of social systems to get malaria drugs, specifically ACTs to the right customer at the right time. Partners within this supply chain such as ACT manufacturers, distributors, funders (donors), policy makers and providers strive to coordinate through a multi-sectoral approach both inside and outside of their organizations amidst daily challenges, impacting on the lives of millions of stakeholders including patients, clinicians and payers.

Within this link, pooling of resources is primarily used to gain access to resources or funds for programme or service delivery of ACTs. Mutabingwa (2005) in support argues that creating a critical mass in awareness and smooth flow of information on ACTs is a result of combined efforts of many actors: international health organizations like the World Health Organization and partner institutions, regional and sub-regional and country malaria networks, researchers and, above all, the mass media. This author argues that these concerted efforts should be emulated in making ACTs available to the affected regions.

DISCUSSIONS

This study aimed to argue and situate coordination dimensions with its insistence on multiplicities and proliferations, conditions that include a resurgent market and macro environment in developing countries. This is because existing coordination frameworks measure coordination mainly through elements of micro environment, and exclude important market and macro factors that are found to be critical in developing countries. From the analysis of quotes presented in Table 2, it is clear that coordination in supply and distribution of ACTs includes not only micro management efforts, but to a greater extent market and macro environment factors. There are numerous coordination frameworks drawn from both the private and public sectors identified in the literature. In the private sector, most frameworks focus on elements of either the micro or to some extent the market environment, or both, ignoring the macro environment.
In support, Soroor and Tarokh (2006) observe that although there have been a number of articles published on coordination frameworks, there has been very little empirical work that includes coordination both within a firm and with external parties. (They do not, however, define “external parties”). The failure could probably be explained by organizations’ simply selecting coordination frameworks and their attendant mechanisms as a way to implementing particular organizational patterns and therefore selecting a structural configuration to match their strategy.

Under the public sector, there seems to be an all-inclusive management environment, perhaps because of the nature and number of stakeholders. For example, micro-framework issues such as capacity building, monitoring and supervision through drug committees seem to be the norm. Under the market coordination framework, network structures such as effective communication between users, manufacturers, suppliers, distributors, retailers, private health units and civil society organizations determine successful supply and distribution of ACTs. The implication is that the role of private sector organizations cannot be ignored, since they complement the public sector.

The macro link is concerned with mainly strategic regulatory roles in mobilization, utilization and monitoring of resources in the procurement and distribution of ACTs to ensure sustainability. Under the macro segment, the main actors are donors, governments (central and local government levels), national medical stores, national drug authorities, non-governmental organizations and civil society organisations, among others. The aim is to streamline processes and avoid duplication among players in the supply and distribution of ACTs. The involvement of government bodies in coordinating supply and distribution draws heavily on the political, societal, and environmental factors of the macro environment. This serves as evidence that for certain geographical areas, such as developing countries, coordination framework need to consider macro influences.

The three links taken together can possibly clarify the tasks, responsibilities and behaviour of sharing information in order to minimize ACT demand uncertainties at all levels, as suggested by Shretta and Yadav (2012). While separate, the three links are mutually reinforcing and cooperation could help agencies coordinate more effectively and achieve success together. The assumption is that frameworks under each link are not static or discrete, and therefore not all dimensions need to be firmly in place before a coordinated activity can take place. In practice, some mechanisms will be in place first, while others will occur later, as the coordinated activity evolves. However, the coordination of malaria partners remains quite fragmented (Yeka et al., 2013). As explained above, this study extends work by previous studies by adopting a conceptualization of a coordination framework, presented in Figure 1.
Local farmers, distributors, wholesalers, pharmaceuticals, warehouses
Private for-profit wholesalers
Private not-for-profit providers (PNFPs)
Domestic / International Public & private Suppliers

Coordination frameworks under market environment

National Medical Stores
Patients
Incentivizing suppliers and licensing private outlets
Employees

Top management commitment
Mutual adjustment
Information sharing
Joint decision making & relationships
Responsiveness
Organizational factors
Top management commitment
Mutual adjustment
Information sharing
Joint decision making & relationships
Responsiveness
Organizational factors

1. Micro Environment Health Facilities’
2. Market Environment
3. Macro Environment

United Nations
Donors
Governments
International organizations
Civil society
Malaria working group

Coordination frameworks under market environment

Set clear policies on funding
Setting up effect surveillance systems
Setting pricing regulations
Working closely with district health workers
Strengthen policy coherence and performance monitoring

Source: Adopted from literature
Under the micro environment, health facilities can adapt the Singh (2011) framework, which has 32 initial codes of coordination mechanisms. On close analysis, they seem broad enough and inclusive of the work of other scholars mentioned in Table 1. The selected framework is composed of top management commitment, mutual adjustment, relationship and decision making, responsiveness, organizational factors and flow of information. These can be applied in the micro environment. Under the market environment, the need for communication, incentivising suppliers and licensing private outlets is pronounced and therefore is deemed critical in the market environment to smooth the supply and distribution of ACTs. The macro environment requires public–private partnerships, setting clear policies on funding, pricing, effective surveillance systems, working closely with district health workers and strengthening policy coherence and performance monitoring.

These are critical to the successful supply and distribution of ACTs in developing countries. This paper therefore argues that a coordinated multi-sectoral approach is desirable. Partnerships draw on the different technical expertise from the management environment and in so doing help reduce duplication, increase resource mobilization, raising awareness of the problem at both the global and regional level.

CONCLUSIONS, POLICY AND MANAGERIAL IMPLICATIONS

From the above discussion, we conclude that there is therefore a need to broaden the theoretical domain of supply-chain coordination within the medical field, basing it not only on the micro and market environments but focusing on a holistic orientation, including the macro environment. Micro and market orientation alone is not sufficient to create superior supply and distribution of ACTs in developing countries, given the dynamics in the larger economy (rooted in national, regional and international contexts). The findings have been schematized in a new framework as shown above in Figure 1, with the hope that it will address the management of dependencies in the wider public health sector. The implication for leadership in the medical field is the need to take a leading role in providing a working climate that promotes interdependence of actors internally, in the market and the larger economy.

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