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New Knots and their behaviours in complex and extended organizations

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Abstract
The new collaborative working and the shifts in modern day work practice is the push behind Organization sengaging in networked collaboration, hybrid interdependencies which are extremely reliant on the use of technological applications. These new forms of dealings have a significant consequence on organizational extension and affiliation complexity which is considered the underpinning proactive development where Organizations don't sit and wait for problems to happen but find ways of understanding different failures and preparing in advance to manage it. Systemic failures in networked Organizations occur where information sharing failures are surprising experienced in the work settings, in part due to complexity in the system and also as a result of the complexity in extended relationships where the system invariably finds ways of reacting and correcting such deficiencies through the use of knots. Whilst literatures on knots and information behaviours exist in different work contexts, there is a different characteristic to the formation of knots reported and with a complementary nature (used as a way of sharing information in extended relationships) as ways of responding to and managing such information sharing failures reported in this paper. These knots mitigate the deficiencies caused by failures in information sharing which force these knots in the setting to form but, in these complex and extended settings, behave in a different way from knots in other settings studied in the literature. The knots reported are motivated and shaped by the extended specialised nature of the setting and serve as a way of filling the expertise needed which cuts across organizational boundaries. The key differences observed are in the 'crafting' process of developing membership, and the speed of formation of such knots and understanding of such behaviours has value for both theory and practice, with implications for decision making and general practice in complex and extended organizational forms.
Keywords: *collaborative working, activity theory, knots, complex and extended Organizations, complexity and extension, extended relationships, information sharing failures.*

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I. Introduction

Modern-day changes in organizational forms and development include, among others,networked collaboration, hybrid interdependencies and organizations highly reliant on the use of technological applications in operations. These havesignificant effect on extension with relationship complexity.Extended organizations are described by Farrel (2008) as ones that cut across units having direct or indirect things in common and whose relations affect each other. An example is a car assembly plant that depends on smaller manufacturers to supply the parts for the production, the roles these manufacturers provide is specialised, and known for that expertise. Similarly, the same kind of example is found in the examination setting where, the such Organization depends on many other entities to achieve its objectives, for example, item generation team, markers, supervisors, exams custodian centres, to mention just a few. IRM (2014) described such relationships as a way of delivering results which Organizations on their own cannot, and such relationships are complex and is increasingly becoming common.Thus, information sharing failure in such settings can be viewed as a systemic failing linked to and enabled by the setting. Such systemic failuresare reacted to, managed and mitigated by organizational action; where the system finds ways of reacting to such failures to correct the deficiencies.This paper reports one of the ways in which extended organizations mitigate information sharingfailures and focuses especially on the type caused by information sharing failures among extended collaborators, such extended collaboration driven bychanges in organizational forms and development.

One of the major behaviours reported in this paper is that of using teams and groups as ways of coping with information sharing failures in complex and extended setting. This is resulting from /made more likely in part at least because of complexities caused by these extensions and affecting both organizations and individuals (primarily organizational-level). However, such teams and groups are observed to have expertise and a complementing nature and are used as a way of reducing the extended divide (cross-boundary distance) due to the use of expertise among extended members in collaborative relationships. It is worthy to state that teams and

groups of various types exist in the ecosystem and do a range of things, however, the case of information sharing failures are not always handle by these structures and that is where knots formation can be observed as a reaction to the events and problems. The characteristics observed in these teams/groups are of knots not just team's due to the need for specialisation. A specific point emerging from the study is that the knots observed and reported in this paper are qualitatively differentfrom the knots described in existing literatures – while sharing the essential characteristics that define them as 'knots' -it is suggested that these differences are such as to extend our understanding of the use of knots in Organizational settings.

As already notedorganizations are going into complex forms of relationships with new ways of working (Landy & Conte, 2016). Among the changes engendered bynew shift and changes is a proactivity development where Organizations don't sit and wait for problems to happen but find ways of understanding them and managing thisthrough collaborative working(Kaatrakoski & Lahikainen, 2016). The new practice, with its attention to risk management and scenarios which may develop, is seen as a way of helping in overcoming information sharing failures and issues of uncertainties and deficiencies of extended relationships; especially important in complex and extended organizations.

The process of collaboration characterised by extension and complexities requires information sharing seen as important, and a means to attain Organizational efficiency and increased performance (Yang and Maxwell, 2011). The level of information and communication technology presently achieved makes information sharing more feasible across Organizations, however, such practice may be affected by the complications such technology brings. Studies have shown that with extension (a network of relationships) such practice can be diverse and complex (IRM, 2014) as they are affected by several factors like technology; the Organizational viewpoint, organizational culture and policies (Yang and Maxwell, 2011).

Other factors observed as being likely to increase the possibility of information sharing failuresin complex and extended organizational settings include the information sharing needs, social dimension and time factor. These factors set back the ability of such relationship to share information within the collaborating partners thereby causing potential areas of failure.One way such Organizations mitigate extension related complexity according to Landy & Conte (2016) is using groups/teams to address productivity problems and to increase the quality and quantity of their product; where task interdependence characterises such teams (Katzenbach & Smith, 1993). Suchteams may (taking the classic definition of Tuckman) consist of between three to nine persons with common goal or purpose that meet and communicate through a medium on a regular basis to achieve that set goal (Tuckman & Jensen, 1977). These are what could be termed conventional and formal team structures within organizational structures.

However, the practice is not adequate in addressing unexpected information sharing failures – which present an immediate specialised problem in work-related Organizations requiring professional expertise skill and knowledge.To deal with such problems knots are reported as a plan for "*Professional interaction and a transformer of professional identity*" (Payne, 2006). Knots as a means of addressing organizational challenges have a respected lineage in the organizational and information sharing literatures and they are known for providing immediate solutions to emerging problems (Korpela, 2015). Some examples of knots are seen in the construction industry where different expertise come together to solve construction related problems. And in the medical areas' knots are used for emergencies and deserter's management. However, the sitting for this paper is not the same as the settings discussed nor are the characteristics of the knots all the same. The concept of 'Knot' is therefore, an appropriatelens in understanding how such organizational challenges / problems are (re)solved. It is a way of joint negotiation and a plan for professionals who interact with one another in a community of practice to find a common ground of solving the immediate professional problem (Payne, 2006).

The concept is described as "short-lived collaboration and efficient accomplishment of a task" and is an essential aspect of problem-solving found among professional involving the use of expertise (Bleakley, 2013) and which this paper is exploring. The concept also illuminates the need for resources to come together from different specialisations, irrespective of boundaries, to solve a problem (Engeström et al., 2012). Knot-working as a relationship is not only open to one Organizational setting; its actuality is an existing practice used across corporate boundaries for improving collaboration which started in the construction industries to (or "intending to") accomplish a task that is organised for designers. However, the concept today is applied to various inter-Organizational studies and disciplines (Kerosuo et al., 2013).

To date, there has not been a particular delineation of how knot-working is perceived, but the awareness of it has changed our way we solve problem in our organizations as indicated in the shift and a step change in recent studies from seeing knot-working as a way of only solving problems to a phenomenon that explains ways of handling the complexity and uncertainty of today's environment. Bleakley (2013) described the shift as a new work order, and the same pattern and change support the study of Korpela & Kerosuo (2014) who described knot-working as a new way of working characterised by a group as a vital part of quality working in knots.

This section has provided the setting investigated which is considered complex and extended with potential for information sharing failures and requiring a proactive respond to the situation. However, where

such responses are missing, and deficiency occurs knots from to solve the deficiency caused by complexities of extension.

II. Methods and Methodology

Activity theory (AT) especially Third Generation Activity Theory (3GAT) was used as a framing tool and lens in guiding the choice of sample as well as analysis, as the approach allows the consideration of transient and cross boundary multiple relationships. More so, AT is aimed at solving a specific problem rather than a generalised one. The theory (AT) is concerned with human behaviour which is embedded in activities (Allen et al., 2013). Thus, AT in this study is used for better understanding and helping to further explain the nature of complexity in the setting and giving meaning to human behaviour.

The approach is becoming increasingly important in information science for framing investigation and in data collection (Karanasios et al., 2009). The philosophical underpinning of this study is constructivist, and the approach used is interpretive drawn from Organizational research which gives meaning to patterns of actions and in turn result in meaning for Organizations (Smircich, 1983). The choice of this paradigm is because it fits the nature of the setting which is complex and extended. The study was interested in a granular analysis of the failure in information sharing within a complex and extended setting which drives the interest in the behaviours that people use to share information is such setting in addressing and coping with failures.

The complexities and failures reported in this paper are best understood using Activity Theory (AT) as a framework for the investigation of the way the communities involved in complex relationships use different tools in getting things done and identifying the deficiencies arising from such multiple relationships. The framework provides a holistic view of the settings and exposes the processes which lead to problems that affect sharing and the level of awareness in exchange of information in such complex and extended environments. These results and ways of reacting to deficiencies are achieved through identifying the areas of tensions and contradictions which are detectable where there is a deviation from established norms or practice. The framework also provides a way of looking at the relationship of the knots activity system to the overall activity system in the examination setting which gives the understanding of some difference from the existing literature which is a contribution to knowledge.

The methodology adopted by this study isbased in qualitative research on a single case study. The case study organization is and examination board operating at a national level and required to both articulate and help to apply Government policy (for example in skill development areas new qualifications may need to be created and promoted) and to work with the educational providers who educate candidates for their examinations (schools and colleges) as well as those who depend on the value and integrity of those qualifications (such as employers and Universities). Research was carried out across approximately one year in the organization with 46 semi-structured interviews from 4 different sets of participants within the case study organization as well as the extended stakeholder community that it works with. Observations of 8 different activities (each between 4-6 hour per observation) for 42 hours was carried out, also document analysis of 18 different reports and newspapers in respect to the organization and it extended community. The data was collected based on a non-probability sampleselected on convenience.

The method and methodology are discussed in this section lighting samples and how the data for this paper were collected.

III. Results/Discussions

3.1 Narrative of knots formation in normal setting

This section gave an analysis of narrative of a ‘heart attack’ scenario in terms of AT, this considered the heart attack as the motivation which attracts a central actor who discovers the heart attack, working with the group (which is the heart attack victim and with those within range of the victim). The tools in such case are primarily simple and, importantly, immediate - asking questions and people volunteering. Culture in such a setting differs according to place but will overwhelmingly be one of ‘helping’, and the setting and community are mostly geographic - those around the incident. Division of labour in this situation is ad-hoc with roles played by different volunteers, and the outcome is the resolution of passing the victim to the appropriate authority as soon as possible.

In such a situation, there are relatively few tensions and contradictions - often resolved very rapidly in terms of asking questions and finding who knows what, or who can do what. (if anyone has a mobile phone to call the ambulance or where is the best access for paramedics). Thus, T&C in such scenarios are resolved at the level of operation rather than action and have to do with immediacy as much as qualification. So, actors will volunteer into what they can do (I will call an Ambulance, I am a First Aider, let’s put them in recovery position….). This heart attack activity scenario provides a useful counterpoint to the activity system of the knot in in a ‘normal’ organizational setting and is, in many respects, far away fromthe type of knots that form in complex and extended settings.

3.2 Scenario observed in complex and extended setting

As opposed to the 'heart attack' scenario this section reports a case in a national practical examination involving different stakeholders where an information sharing failure led to knot formation to deal with the problem – but where the characteristics observed in the formation and development of the knot are quite different (while sharing the essential characteristics of a knot) from the heart attack scenario. This is an isolated example drawn from the set of observations and interviews and has been chosen as an illustration in a simple case of issues observed in a range of settings in the organization and in the extended and complex relationships which form a part of its operational setting. In this specific case amonitoring officer discovered a case of information sharing failure involving a practical examiner who failed to read his email (giving clear instructions about the duties of a practical examiner and the limits of those duties)but instead simply called the examination organization to confirm his name was on the list. The conflict here is based inindividual culture as well as organizational norms – and these impact on individual behaviours in such extended relationships. In this case the organizational norms did not use email as a primary form of communication (although formal structures between the school and the case study organization presumed this) causing information failure during the national examination when the examiner was inadequately informed about what constitutes appropriate practice in the national practical examinations (due to his failure to read emails and, consequently to attend briefing) this action illustratedserious case of tension and contradiction on the way stakeholdersaccess information and process it differently via different physical tools and different information sources available to them causing confusion and tension in the system.

The practical examiner is one of the key stakeholders involved in delivering the object of the examination activity ('a credible and trusted certification for candidates – the 'credible certificate')but is in an organization setting where they do not check email for updates and urgent messages. However, knowing he is one of the practical examiners, he conformed to organizational norms and decided to ask,and confirm from,one of his superiors what the duties of practical examiners are. The response he got was based on the historical norms of his organization and not that of the examination organization, which made him misunderstand the level acceptable and appropriate in assisting in setting students up for the practical examination and, because he is a specialist in that subject, he was effectively (if unwittingly and through good intentions) potentially helping students gain undue advantage in his examination centres. This action is constituting an instance of an information sharing failure (in part at least due to complexity / extension in relationships) as to how this examination process works.

Clearly, the action potentially compromised the integrity of the examination, therefore, potentially undermining the integrity of the credible certificate. On this situation coming to light as a result of the intervention of a monitoring official from the examination board there was a situation to be handled and resolved. Knots in this case was formed (by the monitoring officer upon discovering the abnormality and tension) to handle the situation and bring normalcy back to the examination. This knot is responsive but not as immediate as compared to the heart attack scenario where available volunteers are willing. There is also the need for an expertise in that area.However, a major difference is that the expertise in extended setting was sourced and crafted. Whilst the area of knots remains under-researched (Bleakley, 2013 p.25), the practice is fast becoming an area of interest to many scholars' due to its wide acceptance as a way of involving different expertise in various inter-organizational studies and collaboration (Kerosuo et al., 2013: Kerosuo, 2015).

The acceptance is also attributed to its problem-solving ability involving experts and professionals (Engeström et al., 1999). This type of relationship and practice is as described by a respondent as "Our organization and other examination bodies enjoy good relationship under the umbrella body of examination association and are ever ready to form a combine team in solving a common problem of the whole bodies".

The scenario and extract above suggests extended relationships that enjoy sharing information and collective problem solving where the need arises. It also suggests a cross-boundary common problem solving and specialisation in their area of communal existence. Analysing this extract from a respondent alone side the observed scenarios using Activity Theory (AT) "combine team form to solve a common problem" is an indication of knots forming as a way of problem-solving found between extended partners. The extant literature also suggests that not only do knots solve problems, they solve problems requiring rapid instantaneous solutions (Mizushima et al., 2012).

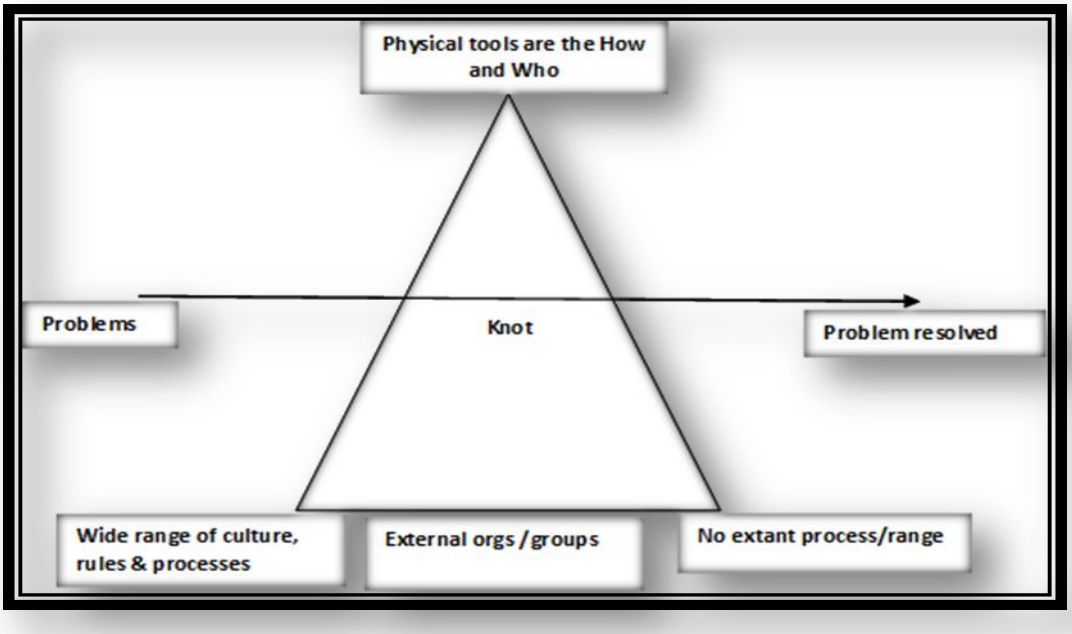

Figure 1 AT analysis of Information sharing failure in complex and extended settings: *Source: Paul Bata (2018)*

The physical tools used in complex and extended setting are the 'how and who' as against the immediate and volunteering. The who is about who is available and how to get them, this activity set up primary and secondary tensions & contradictions with a wide range of culture, rules and processes making it impossible to determine what to expect. Because the activity system is unexpected, there is no existing process in place to deal with such. The narrative and scenario discussed in this paper describe instances where knots form as a way of reacting to deficits and shortcomings of information sharing in extended organizations, where the lack of information or the failure of sharing the right information has created a problem.

The problems are driven through tensions and contradictions in the activity system as that of the examinations, which drives a set of reactions of which the formation of knots is one. An example is if the information sharing failure through tension and contradictions exposes a training need then a forum for coordination of training across partners may be the formal team reaction to the longer term (short term is the formation of knot) driven out of the need to respond to the issue the knots must deal with.

The areas of tensions and contradiction create and drive the changes in the situation of examination and the changes are the types that require response refers to as stages of reaction in line with the studies of Engeström et al., (1999) where knots are discussed to handle such problems. The knots reported in this paper, however, while clearly and demonstrably meeting the characteristics of knots as discussed in literature (e.g. Bleakley, 2013; Engeström et al., 1999; Engeström et al, 2012; Kaatrakoski & Lahikainen, 2016; Kerosuo et al., 2015; Kerosuo, 2015; Korpela & Kerosuo, 2014; Korpela, 2015 and Payne, 2006), are different in some key aspects, as described in the scenarios from the knots in existing literatures.

The knots are sought and crafted, which is an indication of expert boundary crossing in solving the institutional conflict caused by complexity and extension as in accordance to the study of Kerosuo et al. (2015). The process of crafting knot membership as reported is based on meeting all the conditions listed in the literature for knots but with some difference. Crafted knots as the name suggests, are crafted. These types of knots are sought after among specialist collaborators who are stakeholders.

The knots are crafted which means that availability is found within the extended collaborators locally. Whereas, if there is limited availability the crafting will involve the process of "spread" and/or "reach": where the "spread" is the area covered by the knot, based on specialisation and the "reach" is where limited availability exists and where it is hard to find the required expertise within the problem locality. (By limited availability, the study is referring to the available specialist workforce, where this is lacking to the extent that it constitutes a problem to the operation of such organization). It would not be out of place, therefore, to argue that where availability of suitable specialised members exists, crafted knots will be formed without going through an explicit process of spread and reach as shown in Figure 2, but the process of crafting must take place to fill the expertise.

Whereas urgent in Figure 2 means is an issue that has to be resolved urgently but not as that of instant knots, it can still go through spread and reach depending on availability. The less urgent knots is where organization takes its time in crafting the membership of the knot. The two process of crafting involves searching for the right person with the right expertise and knowledge of the problem to make up the knot. The manner of searching is a much slower formation process due to the extension involved. Thus, the instant knots are the normal setting i.e. heart attack scenario, and urgent and less urgent knots are mostly found in extended setting where availability need to be sought.

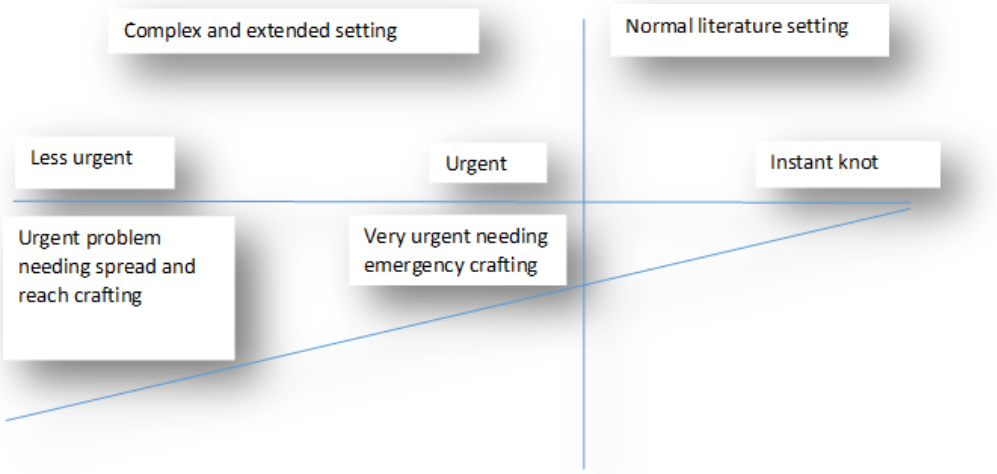

Figure 2 Crafted Knots showing explicit process of spread and reach: *Source: Paul Bata (2018)*

The search in some cases covers a widespread where collaborators are available, and reach indicates extend to which the right person is not just readily available, hence search will stretch cutting acrossboundaries due to limited availability. This process visibly is slow as compared to where there is availability, i.e. volunteering as in the heart attack narrative or where there is pooled membership. The type of knot discussed in this paper are improvised and not planned, however, in some cases, such knots may be expected at some level – the exact nature of the issue is not known, but it is expected that 'something could crop up' and generate the need for a knot to form.

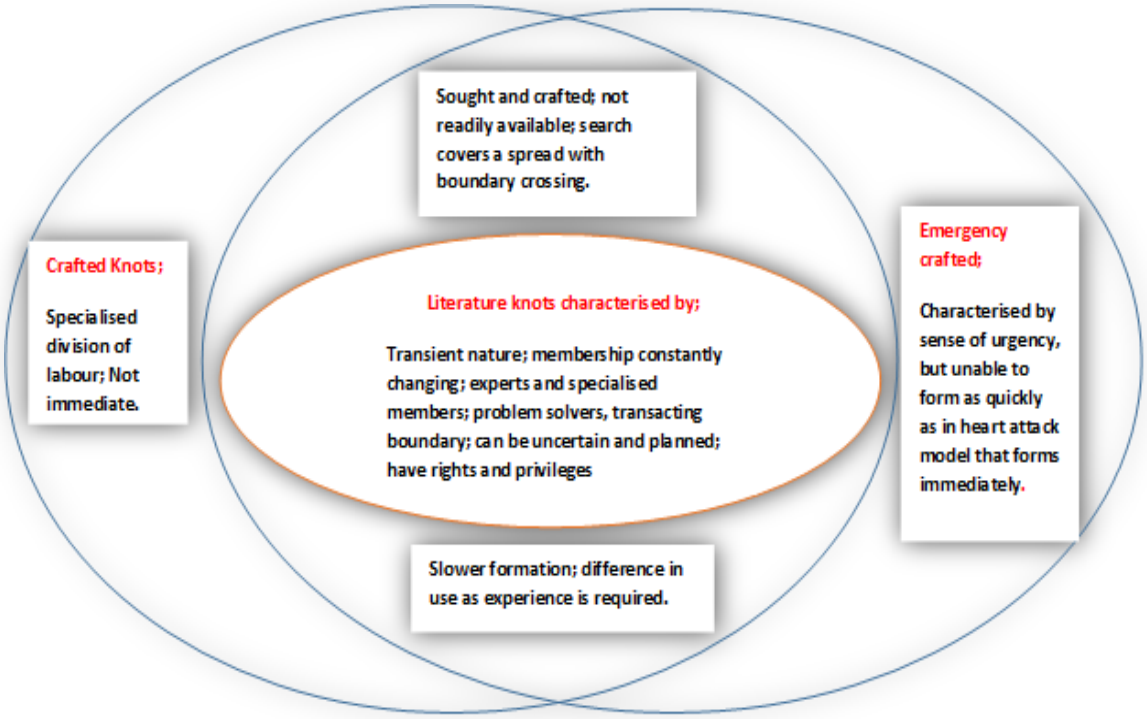

Figure 3 showing intersections and congruence with literature knots: *Source: Paul Bata (2018)*

Figure 3 also shows areas of commonalities between the different knots including; literature knots (based on extant literature) and the crafted knots (spread and reach). Crafted and emergency-crafted in Figure 3 bothhave intersections which are congruent with literature knots as areas of commonality and they then extend or build on that as a variant of the process / characteristics. That such knots are variants of the currently conceptualised form. The characteristics of literature knots are also seen in crafted and emergency crafted knots in that; they are transient in nature, their membership constantly changes as knots change, they use experts and specialised individuals, they transcend boundaries, they have rights and privileges and they can be formed under uncertain circumstance or can be planned (anticipated as to need, not as to form/event) knots.

IV. Summary and Conclusion

The modern-day changes in organizational forms and development include networked collaboration, hybrid interdependencies and organizations highly reliant on the use of technological applications in operations. These have significant effect on organizational extension and relationship complexity. These observed behaviours are that of using specialised knots as ways of coping with information sharing failures in complex and extended setting, resulting from /made more likely in part at least because of complexities caused by these extensions and affecting both organizations and individuals (primarily organizational-level).

The knots reported in this paper share much with the existing literature on knots, which are transitory, take care of that problem and then disband. These knots are differentiated, however, by being a result of the extended /specialised nature of the setting, which acts as a way of filling the need for expertise by cutting across organizational boundaries. There is also a deliberate choice of membership and a lack of availability when and where required. The knots reported do not just form; they are sought after based on availability and the specialisation needed to solve the problem at hand.

These knots are 'crafted', which explains that their membership is based on the acquisition of the special skills needed for that problem which equally suggests that they can be slow to form. This phenomenon of knots reported in this paper contributes to meeting the objectives of exploring the nature and types of knots found in the setting and how and where and why these knots are different from the knots articulated in other literature.

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