COPELAND CONSTRUCTION SERVICES
Improving Processes to Meet Customers’ Needs

Case study
Reference no 311-113-1

This case was written by David W Parker. It is intended to be used as the basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation. The case draws on the extensive commercial and research experience of the author.

© 2011, UQ Business School.
No part of this publication may be copied, stored, transmitted, reproduced or distributed in any form or medium whatsoever without the permission of the copyright owner.
COPELAND CONSTRUCTION SERVICES

James Maitland, Operations Director: Copeland Construction Services has been in his current position for almost nine months. He was the financial director for Europe’s largest privately owned construction company, he then moved to the US as Corporate Executive - Construction Services for one of the big-three tier-one civil engineering companies before joining Copeland Construction Services. Much of his recent time has been spent in Chile; and it was this successful period that made him particularly suited to his current role. His pragmatic, no-nonsense approach, in addition to his astute strategic awareness, makes him aptly suited for his current functional services role. During his time in post, he has reviewed and benchmarked against world class constructors a series of critical features that he believes underpins Copeland’s sustainable growth and development opportunities. While acutely aware of the prevailing market conditions, ramifications of the global financial crisis (GFC), and intensity of international competitors, he is also mindful of the leverage opportunities resulting from Copeland’s diversified portfolio of services and markets, its 15 years track record, and its skilled workforce.

However, James has identified several critical areas needing improvement. The most significant aspects will need immediate action; whilst other improvements can be made inside of the next 18 months Consequently, James has brought together his senior executive team for a workshop, supported by external facilitators, to develop an Action Plan - identifying where Copeland’s should be in six, twelve and 18 months time, what are the changes and resourcing, and how it will get there. James acknowledges the collective experience of his team; yet he also recognizes the usefulness of external sources to inform and offer ideas for future direction. He therefore encourages his team to draw on as many sources of information and best practice as possible. Appended to this case study is a list of useful sources (and available to you).

Over the last nine months he has observed problems associated with there being no clear understanding of the early signs of possible project failure (identification of risks). In his opinion, quality issues and client relationship management is poor. Performance appraisal is not achieving its purpose. Processes and systems are slow and bureaucratic. Teamwork needs improving. Leadership needs developing. In fact, in-line with academic research, James has listed in rank-order reasons why there is a need for appraisal:

1. Lacking appropriate leadership
2. Poor communication
3. Insufficient stakeholder relationship management
4. Poor risk assessment and contingency planning
5. Inadequate initial planning and scoping
6. Lack of problem solving skills
7. Poor activity/project closure
8. Misalignment of team skills and project’s needs
9. Deficient process monitoring
10. Cultural awareness

James next expands on his initial observations and identifies where he believes the team should focus their attention. Had this activity been undertaken by an external consultancy, there would have to be a considerable amount of time and effort taken to gain understanding of the business.
Functional and Technical Leadership
James Maitland is acutely aware that his management group is responsible for the performance of teams of highly skilled and experienced individuals. Various functional teams operate: Estimating, Operational, Management, Support/Administrative and Project Teams to name but a few. Bottom-line performance is generally associated with the success of the Project team. However, the teams providing support services are critical to the Project; and this requires a cohesive technical team that has excellent leadership.

The challenge, therefore, is to ensure that the manager is equipped with necessary leadership skills and knowledge of the team to ensure necessary outputs. Listening to needs and understanding what staff perceive as deficiencies or areas of concern is critical to ensuring a profitable business. Several internal staff surveys had identified leadership as needing continuous development.

James emphasised that leadership is the ability to influence individuals or groups toward achievement of goals. Leadership as a process shapes the goals of a group, motivates behaviour toward achievement of those goals, and helps define group or organisational culture. It is primarily a process of influence. It is therefore critical that an appropriate leadership style is adopted whenever necessary.

Many organisations were adopting authentic styles of leadership and developing managers with emotional intelligence. However, cultural factors need to be considered, and there was evidence to show that servant-follower models are better suited in some situations. James has flagged this as an area needing investigation.

James Maitland said that from his own reading he was particularly interested by the ideas of Goldman and also Goffee & Jones. Goleman's model outlines five main emotional intelligence (EI) constructs:

- **Self-awareness** – the ability to recognise and understand your moods, emotions, and drives, as well as their effect on others (using gut feelings to guide decisions)
- **Self-regulation** – the ability to control or redirect disruptive impulses and moods. The propensity to suspend judgment – to think before acting
- **Motivation** – a passion to work for reasons that go beyond money or status. A propensity to pursue goals with energy and persistence
- **Empathy** – the ability to understand the emotional makeup of other people. Skill in treating people according to their emotional reactions
- **Social skill** – proficiency in managing relationships and building networks. An ability to find common ground and build rapport. (Relationship management– the ability to inspire, influence, and develop others while managing conflict).

Research by Goffee and Jones has identified some popular myths with regards to Leadership.

- Not everyone can be a leader, they don’t possess the self-knowledge or authenticity for leadership in addition individuals must also want to be leaders.
- Leaders don’t always deliver business results, businesses can do rather well with competent management rather than having great leadership. Also some well led businesses maybe not producing results due to being in the development phase of a business.
- The statement that people who get to the top are leaders is not necessarily the case as they may have progressed to that role due to other aspects not purely leadership qualities. Leaders are simply people who have followers.
It is rare that leaders are great coaches, due to the fact that a leader would have to be able to inspire as well as impart technical skills to the followers.

James Maitland had experience in the US of using Blake’s Grid to identify the leadership style of the leader to see if there is too much emphasis on technical aspects at the expense of soft skills. Once identified it is possible to analyse styles effectiveness and then see whether there is a need for additional skills such as including others in problem solving, improving communication, or clearer about scheduling or monitoring of progress. It has been suggested that there is confusion around who is accountable for budgets and profit targets; and there is poor team cohesion currently does not exist. A blame culture and clear division of teams is evident Once again surveys had shown communication as a company-wide problem and improvement in this will sustain cohesive performing teams.

Project One: To meet the operational demands for the foreseeable future, James requires you to investigate suitable models of technical and functional leadership and recommend a justifiable course of action to ensure the most appropriate leadership styles are adopted.

Agile Models of Delivery
James Maitland has had extensive experience of alliances. They were first used in Australia to deliver major oil and gas projects in Western Australia and have since been used by the Commonwealth and State Governments over the last five years to deliver a wide range of major engineering infrastructure. For example, Thiess (a competitor of Copeland) capitalised on this method of delivery securing various alliance projects including Awoonga Dam, East Link, TrackStar and Hinze Dam.

Whilst there is no doubting the significant contribution that such mega projects have made to the growth and strength of companies through increased turnover and profit, we are now faced with having to re-adapt to changes in the construction industry which require teams with the skill and ability to operate in a fierce competitive market; and management having to develop new strategies to secure and successfully manage complex and multi-stakeholder projects.

The construction industry operates in a continually changing environment with client needs evolving around different delivery systems based on current market factors. Within an alliance the risks are shared between the partners; whereas in a competitive priced project the risk is accepted by the contractor with a guaranteed cost to the client. Hard dollar contracting requires high performing teams with a different mix of skills from those of an alliance, teams that are agile and adaptive, teams that understand strategic flexibility, teams that can recognise change, maximise opportunities and influence outcomes using persuasive negotiation.

James Maitland recognizes that the test is to be able to operate in an alliance project team that works with a collective responsibility for delivering the project, and, alternatively, operate as a more disciplined team that can deliver in a competitive market environment. Currently, some 15% of bids are won; and significant improvements can be made to this success rate.

In an alliance there is a strong emphasis on relationship contracting with a culture of no fault, no blame and no dispute between the alliance partners. Under hard dollar competitively priced projects, the expectation is to form a high performing team delivering the project for the least cost and on time, to maximise profits, all within tight tender direct costs and a narrow band for failure. To be successful the team has to drive the following factors, all of which are against alliance principles:
- Find ways to increase revenue
- Seek out weaknesses in the contract, specification and scope
- Risk transfer
- Exploit change and delays to maximise profit.

It is clear that change is required to succeed on hard dollar contracts, leaders need to make changes in how hard dollar projects are managed in order to cope with a new, more challenging market environment. The Thiess leadership need to guide this change in contractual mindset from either an alliance culture or to a competitive environment.

It is commonly argued that from a client’s perspective, the traditional risk transfer approach is preferable for most projects, particularly where the scope is clear and the risks reasonably predictable. However, due to the demands that clients are placing on project delivery, more bid documents are being put out to tender amid an environment of uncertainty around finalised design and scope. For this reason a fair portion of hard dollar projects are being delivered as a schedule of rates contract that can accommodate change and variation. Whilst these potential complexities present added challenges to the project team it is also offers an opportunity to maximise profit.

The ability and skill in recognising variation to a contract, plays an important part in a hard dollar competitively priced project, which may well have been priced with a lower margin and risk managed by the contractor. The margin for getting it wrong in hard dollar contracts is small with severe cost implications.

Whilst the traditional principles of construction do not differ between an alliance and hard dollar contracts there are other factors that significantly increase the cost of the project which are out of the team’s control. These factors are influenced by the client’s behaviour and have to be managed within the boundaries of the contract by the team:
- Changes in drawings issued for construction versus tender drawings
- Incomplete drawings
- Lack of timely decisions by the client
- Excessive change orders.

The team skills required and communication channels needed to successfully deliver both hard dollar contracts and an alliance culture need careful consideration.

There is a perception in the construction industry that alliances are soft contracts and as a result clients are adopting competitive alliance delivery methods to guarantee best price on task oriented contracts (TOC’s); in addition to adding overseas companies to the tender shortlists to bring international competition to the domestic market.

**Project Two:** James Maitland requires you to evaluate the issues raised above and propose what might be improved i.e., adapting teams to become agile and so transform from alliance delivery contracts to hard dollar competitive projects and **vice versa.**

**A Vertically Integrated Delivery Model**

Tender conversion rates are an industry-wide problem affected by a multitude of complex and interdependent factors. Over 100 bids had been conducted in the past year. It is critical that we identify the customer value proposition to deliver on perceived needs as well as functional requirements.

James Maitland has suggested that his technical and functional management team considers a vertically integrated model of project delivery as an alternative to traditional sub-contracting relationships. Clearly a disadvantage to this approach is the continuing resource costs and reduced capital utilisation associated with its adoption. However, there may well be considerable advantages, especially from continuity of staffing and stable
relationships. Therefore an evaluation of this delivery model is needed. An initial investigation of vertically integrated delivery models has identified:

- Improvement in safety performance; strong safety culture and improved safety performance – giving compelling market differentiator
- Driving and managing an improved safety performance within the structural trades as well as controlling the critical programme elements of the project cycle, we could gain surety of delivery and foster a superior safety culture within the company;
- By vertically integrating the delivery model, we keep the high added value revenue trades in house thereby increasing overall profitability;
- Continual improvement via an organically grown in-house capability
- Allows direct control and flexibility over critical civil/structural elements; certainty of delivery for clients making us more attractive
- Provides a surety of delivery by utilizing a known quantity/skill set
- Perceived profit gain by keeping the margin within the business; with savings passed onto client through keener pricing
- Securing the supply chain particularly with future skills shortages
- Revenue and margin gains through increased project opportunities and wider market exposure of the Copeland brand
- Creating a culture that lives and perpetuates the Copeland values; productivity gains through a skilled workforce providing strength in capability to deliver on programs and budget.

James stated that any review of the present model and consideration of an alternative approach should consider and address the following factors:

- At present we cannot compete on price with small external subcontractors whom operate with minimum overheads and cost base
- We have struggled with cost control and performance monitoring
- There is a perception that we cannot add premium value to the offering
- How do we find and align with enlightened clients who can see the benefits of the vertically integrated model. Is the Australian industry mature enough for these enlightened clients to exist in numbers or (unlike Europe and the US) would we be ahead of our time ‘to our own detriment’.
- Few external subcontractors provide surety of delivery and value for money, which may erode our perceived market differentiation.
- For certain sector clients, price is still the defining selection criteria in nearly all arenas
- Industry experience of vertical integration suggests that the internal value added stages rarely if ever materialises, and the only true reason to integrate is to secure the forward or backward supply chain to ensure supply can be met at secured rates and guaranteed quantities/and level of quality.
- Does the model fit the present skills availability?
- Does the integrated model fit all sectors?
- The client is generally Projects. Which means there is little or no opportunity to increase revenue via design development variations or scope gaps? (Traditionally this is where structural subcontractors can go in with a keener price, knowing they should make it up at a later date based on the documents they are pricing at the time).

Businessdictionary.com states: ‘transformational change is defined as a shift in the business culture of an organisation resulting from a change in the underlying strategy and
process that the organisation has used in the past. A transformational change is designed to be organisation-wide and enacted over a period time’.

Current obstacles in any change process relate to performance and output, team relationships, cohesion amongst team members and, most importantly, a change in role and responsibility for many key staff across the business. It has been told to James that such changes in role have never been clearly explained, leaving them feeling disengaged, protective and possessive of information, resulting in teams never moving past the storming stage throughout whole project life cycles. In his book Managing Transitions, William Bridges describes that there are three phases of change transition, with the first stage equating to ‘letting go’ of the old ways and the old identity people had, it’s also the most difficult stage, as how do you get people to let go of the present? The second phase is described as an ‘in between time’ when the old is gone but the new isn’t fully operational, often referred to as the ‘neutral zone’ when realignment of psychological processes and procedures takes place. The third phase is described as making a new beginning, this is when people develop a new identity, experience new energy and discover a new sense of purpose that make the change begin to work. Research also suggests transformational change will only be accepted by people if they can be persuaded to think differently about their jobs.

**Project Three:** James suggests that a SWOT analysis or PEST evaluation might help in clarifying the advantages and disadvantages of alternative models of project delivery.

**Performance Management**

As with many organisations, Copeland Construction undertakes formal performance reviews with all staff; normally this is bi-monthly progress and monitoring appraisals and annual reviews. The key performance criteria are generic milestones derived from the corporate strategic plan. However, James Maitland has anecdotal information that suggests that sometimes the performance reviews are regarded by all concerned as bureaucratic inconveniences and not fulfilling their original purpose i.e., to manage poor performance and reward and support high performance. It has been suggested that the KPIs are not always authentic and applicable; and sometimes do not reflect the strategic intent of the business. James has suggested that his team considers the role of performance appraisal and the current situation. He is interested in the concept of identifying Key Performance Question (KPQ), the aim of which is to assist in identifying and articulating information and trigger a search for answers. In essence the KPQs should identify what questions the Key Performance Indicator (KPI) should be answering. KPI’s are used extensively throughout the organisation to measure how the business is performing; and the management team has made use of these in assessing how successful or unsuccessful a project had been.

The KPI’s that the business uses includes measures of budget/profit, safety, quality, labour outputs etc all of which are generally reviewed on an ongoing basis. The level of resources, time and opportunity cost required to produce the monthly KPI’s are significant – and we should be asking if the performance process is cost-effective.

James says that as a business we need to carefully re-consider the KPQ’s to provide a more targeted KPI which provides a level of certainty regarding the project performance whilst minimising the resources required to measure. He believes that his team should ensure that the KPQs and KPIs align to the corporate strategy. This would allow a more efficient use of the project resources and allow a focus on production and delivery rather than ongoing measuring and monitoring.
**Project Four:** James wants the team to consider performance management as an area for potential improvement and suggest alternative models for future consideration.

**Complexity and 80/20 Rule**

Pareto Analysis (80/20) is a well established principle. For James Maitland it can be summed up by stating that 80% of potential improvement comes from 20% of things that can be done relatively quickly, or put another way, 20% of management effort might give you 80% of the results. In essence the 80/20 principle encourages you to be selective in the tasks which are tackled to ensure they are going to have maximum impact. In reflecting on this, James believes that this will be an important principle to keep in mind as the team formulates recommendations for improving the way in which the business delivers its projects.

Closely associated with this idea of focusing management’ attention on the most importance is the notion of **complexity**. The Impact versus Ease tool to prioritise improvements could provide a useful approach and method of prioritising potential improvements within the business. Following the reflection above regarding the need for focused improvement strategies for our project in line with the 80/20 rule, use of the Impact versus Ease tool will allow the project team to identify the important areas. The Impact versus Ease tool effectively weighs the balance between the impact a potential improvement or change will have against the difficulty of actually implementing it. In other words, it will assist in presenting practical and effective recommendations to improve the way in which Copeland delivers projects.

James suggested that every project must be mapped to indicate all stakeholders across multiple levels and have a customised plan to engage these key stakeholders across all levels of the business, from site project managers to CEO engagement. This detailed plan will give clear lines of communication and allow project issues to be resolved early and efficiently at the correct level without damaging the relationships.

**Project Five:** James Maitland suggests that you consider this method and the associated tools and methods required.

**Innovative and Creative Culture**

Identified in Copeland’s Mission Statement is the phrase ‘…. maintaining a culture that fosters new ideas and better ways to deliver creative outcomes….’ It is therefore vital that this intent is supported through built-processes and identifiable outcomes and targets.

Jim Maitland has asked his team to define what this phrase means, both to internal customers and to external customers, what processes are currently in place to support innovation and creativity, and how are they being measured. If these requirements are not possible, asks “why not?”

The ability to build high performance teams and implement sustainable organisational change will underpin Copeland’s ability to deliver innovative solutions. The consideration of team dynamics and the conditions functional personnel operate under have a significant impact on the culture of teams. Coupled with this, the frameworks adopted for implementation of change will impact significantly on the company’s ability to develop a climate of innovation. With specific focus on the technical personnel, survey data indicate that whilst we have a dedicated group of employees who have a level of passion for the company we are not fostering an environment that will deliver high performing teams and facilitate sustainable organisational change implementation. Where we expect functional and technical groups
to deliver innovation this poses a significant challenge to leaders in this part of the company.

There is currently a perception that:
- People are not treated equally
- There is a disconnect between senior management and functional teams
- Leaders do not deal effectively with poor performance
- There is insufficient time to perform the range of duties
- Professional development is not encouraged
- There is not a clear vision of Copeland’s future

In his book “A Failure to Learn” Hopkins identifies the need for organisations to take on events, in the case of the book a significant loss of life through a preventable incident, and ensure that they do not fail to learn from the past and ensure that similar mistakes are made again. Whilst the book is focused on a catastrophically bad event, parallels can be drawn to any significant event, good or bad. The impacts for functional and technical leadership are significant with some of the most compelling evidence to ensure that leaders actually “walk the talk” and escalate technical issues to the highest level of the organisation beyond the line management. “What are we doing to learn from our experiences?” James asks.

The organisational imperative for Copeland is to achieve a climate of innovation and build a culture of high performing teams that operate in a way that delivers innovative solutions. To continue to repeat the failings of the past is unacceptable and restricts the company’s ability to grow beyond its current delivery models and client engagement strategies.

Contemporary views on innovation as expressed by Kanter suggest that companies are seeking new categories to enrich existing businesses rather than grand new ventures that will take them into totally different realms. Copeland needs to be focused on remaining true to its core strengths, business drivers and existing competitive edge despite the ever changing environment it works within. This model for innovation suggests that we have a very clear vision for what the company does and that the flexibility to adopt new work methods or technologies simply provides commercially deliverable improvements on existing strong processes.

Kanter goes on to suggest something akin to an innovations pipeline, where some ideas are at the implementation phase, others are at the test phase and yet more are just ideas, not yet understood as being good or bad. This pipeline of innovative changes would be supported effectively by the Kotter model for change along with a team based approach to implementation.

A critical aspect of successful innovative companies has been their ability to maintain the development of innovative solutions within the mainstream practices of the business. This ensures that as many personnel as possible are engaged in the process and also ensures that changes are not seen as external to the core business activities when it comes time to implement. In addition, the role of leadership in ensuring that teams responsible for designing the innovative change are behaving as true teams where the technical experts have roadblocks removed and communication about the change is effective.

The leadership of innovation requires personnel with significant interpersonal skills who can create a supportive and collaborative culture for the innovators themselves. This provides a key distinction between leadership of and the design or delivery of innovative solutions.
Project Six: James Maitland wants his team to take up the challenge of considering how a culture of innovation and creativity might be developed; how can people become more engaged and feel proud of being part of Copeland.

People are our Competitive Edge
It is a truism that any of Copeland’s competitors can quickly match or better its current technology and equipment resources. Its competitive strength is in its people and their skills, experience and motivation. People are the interface between clients and the company (reputation and brand image). James therefore places people at the forefront of continuous improvement initiatives. High performance teams are described by Caprioni as having:

- Clear boundaries (clear identification and understanding of who is in/out of the team with external personnel recognising the team as a unit)
- Common tasks (a collective responsibility for outcomes)
- Differentiated member roles (individual accountability for particular meaningful tasks and skills)
- Autonomy (team members have some discretion over how they work with clear boundaries for decision making authority the allows individuals to “own” their work)
- A dependence on external people and resources (external input will be called on for the completion of certain goals)
- A collective responsibility (feedback will be provided to the team as a whole reinforcing interdependence).

The leadership role in a high performance team is pivotal in developing an environment for success - moving from a workgroup to a team by having shared goals; leaders should spend more time managing the context within which the team works rather than in direct contact with the unit. In facilitating these conditions a leader’s actions will be successful in holding the unit together to deliver consistently high quality results (outputs), personal well being for and development of individual members along with the enhancement of team competence and commitment over time.

A key factor in high performing teams is the duration for which they behave as a unit as they will become increasingly capable over time. This has particular impact within a project based company such as Copeland as unlike many projects, functional departments exist for many years. Some mining projects exist for this length of time and small functional (and often high performing) teams develop in these instances; however this is not the norm. The ability for the company to hold existing high performing or potentially high performing teams together over time remains a risk. Any opportunity to extend the lifecycle of a team’s performing phase should be exploited.

On the issue of team makeup Collins talks of the concept of ‘First Who’ then ‘What’, indicating that the question of who is in the team and what skills they bring, how they will behave and interact are to be answered first and only then can issues of ‘what’ can be addressed - strategy, structure, tactics and so on. ‘First who then what’ should be our maxim James says. This approach is aimed at delivering a strong team with clear values and norms able to excel in adverse conditions.

Project Seven: James suggests to his team they identify what lessons might be learned and adopted in our current operations from these ideas.

Concluding Considerations:
James recognises that he has highlighted an extensive range of issues for his team to consider (at least seven projects). However, he is not seeking immediate answers. He believes that his team is now setting off on a journey of learning and as a result there will be substantial improvements – both to the company and to themselves. He also recognises that implementation of improvements will require exceptional change management skills.

Kotter’s analysis of why change efforts fail yields a framework for implementing change by analysing what is missing from failed attempts to deliver change. Kotter draws a link between long term business success and an ability to continually reinvent oneself, without losing the ability to draw on the underlying strengths of the organisation. The model suggests eight elements that must be adopted for successful change implementation.

1. Establish a sense of urgency – a gut level determination to make a positive change now!
2. Form a powerful guiding coalition – including all the aspects of high performing teams including strong leadership.
3. Create a vision – a desired future state and strategies to deliver.
4. Communicate the vision – Utilising all of the vehicles possible to ensure full communication of the change, ensuring that leaders embrace and behave in the new way.
5. Empower others to act – Remove barriers to others becoming part of the change effort, fostering further innovation and change.
6. Plan for and create short-term wins – being conscious that the first short-term win is not the end of the process incremental change should be acknowledged and utilised as a further vehicle to communicate more change.
7. Consolidate improvement and produce more change – leverage gains already made to underpin the vision and “chock the changes in place”.
8. Institutionalise new approaches – Provide connections between the new way of work and success, building change into the corporate culture of leadership.

Kotter’s eight steps to sustainable change provide a framework for leaders to utilise and foster a culture of ongoing, sustainable organisational change and a vehicle for implementing innovative solutions. The ability for a team to utilise this normalised process will, over time, accelerate their ability to perform structural and innovative changes to the way projects are delivered.

James envisions a model for delivering functional and technical goals that support groups of high performing teams with leaders responsible for managing problems. The resilience and adaptive nature of team-based functional groups allows adaption to and acceptance of change in a more efficient manner, allowing Copeland to exploit the competitive edge provided by adopting and delivering innovative changes to the way we deliver our projects better than our competitors.

Identifying the core passion, key financial drivers and existing strengths of the business, and ensuring leaders of teams focus the development of innovative solutions in these areas will ensure that innovation is supported by the broader business and can be successfully implemented. It will also ensure that the changes are not so far from our core as to divert us from what makes Copeland, ‘Copeland’.
RESOURCES (Available for reading)


Clarke, N. 2010, Emotional intelligence abilities and their relationships with team processes, Team Performance Management Vol. 16 No.1-2 pp. 6-32


Hopkins, A 2009, Failure to Learn: The BP Texas City Refinery disaster, CCH Australia Limited


Parker, D. 2009, Complex adaptive systems: Managing people, projects and systems for the next generation of project professionals, Decision Science, (12) 3.


